

# ARTS & DISCOVERY



50 CENTS

CALIFORNIA ACADEMY OF SCIENCES

May-June 1954

VOLUME VII • NUMBER 3

# A JOURNAL OF NATURE AND MAN **PACIFIC DISCOVERY** IN THE PACIFIC WORLD

Editor and Art Director: DON GREAME KELLEY • Managing Editor: ROBERT C. MILLER  
Associate Editors: A. STARKER LEOPOLD (University of California) • IRA L. WIGGINS (Stanford University)  
BENJAMIN DRAPER, ROBERT T. ORR, EDWARD S. ROSS, VERONICA J. SEXTON (California Academy of Sciences)  
Special Correspondents: RUTH E. HOPSON (Oregon) • THANE RINEY (Wellington, New Zealand)  
Advertising and Circulation Manager: RUEL R. CROCKER, JR.

Vol. VII • No. 3

May-June

1954

FROM TIME TO TIME we find it worth while to try to rediscover *Pacific Discovery*. Such a time is when we sense a new audience in the offing. Not that science teachers and their students are new to *PD*, or vice versa; but that the Bay Area Science Fair's opening by strange coincidence on our publication day (we're about three weeks earlier than usual, oddly enough) provides us with—a captive audience; we therefore find it well to look both ways from the present at what we are doing (and hope no English teacher sees this sentence!)

## PRE-DISCOVERY

*Pacific Discovery* began thirty-nine bi-monthly issues ago because it was believed at the California Academy of Sciences that the West needed and would support its own magazine of this kind. Responses to the first announcement and first issue were exceedingly gratifying. Although ordinary subscriptions were invited, Academy membership forthwith took the biggest jump in its history. Apparently the Academy was not only selling a magazine; the magazine was selling the Academy! Subsequent growth has been somewhat slower, naturally, but steady. Nothing has given the officers of the Academy and the editorial staff of *PD* greater satisfaction than to see an increasing number of libraries, schools, and teachers on our subscription list, as well as among the institutional and regular members of the Academy. Above all it has pleased us to hear from many science teachers that they use *PD* in classes. Satisfaction stems from the fact that the Academy exists for the twofold purpose of research and education. Its collections and technical publications serve chiefly the first part; exhibits, TV, and this non-technical magazine, the second.

Our most searching thought — speaking for the entire staff — has gone into making this the magazine we believed our present and potential readers would want. Ninety per cent of the reaction comes apparently from those who like it this way; dissenters have only to speak to be listened to. Admittedly *PD* has always been hard to “type” — it was not patterned after any other magazine. It has been something of a nature magazine, something of a geographical journal, always a spokesman for the cause of wildlife and natural resource conservation. It has editorialized on everything from academic freedom and loyalty oaths to Daylight Saving Time and functionalism in the design of automobiles. It has sought to encourage the reading of good books in its various fields as they come out in seemingly ever greater numbers in response to apparent demand. If it has been open at times to the charge of considering “man and nature” rather more than “nature and man,” it may be reflecting, not altogether unconsciously, a growing awareness that man is nature's greatest headache, and also his own most interesting subject!

Weldon F. Heald of Arizona, author and mountaineer, knows the Western out-of-doors as few do, and has put his knowledge into popular guidebooks to it, state by state. . . . ¶ Dry summer travelers, and those who pass at any season over U. S. 40, Bay Area to Valley and Sierra, welcome — year in, year out — the

## DISCOVERING PD'S AUTHORS

oasis of The Nut Tree. A pioneer family has long owned this caravansary, and Robert H. Power, observant amateur in historical research and Academy member, is of its younger generation. His Drake theory is his own, and should it prove out, the credit is his. . . . ¶ Raymond M. Gilmore, Wildlife Research Biologist, U. S. Fish & Wildlife Service, is studying California gray whales with Scripps Institution of Oceanography, La Jolla, as a base; Gifford Ewing, Research Oceanographer at Scripps, pioneered the whale survey by air. We thank the Director of the Fish & Wildlife Service of the Department of the Interior for allowing us prior publication of their story, and Scripps Institution for its ready cooperation. . . . ¶ Editor Charles N. Webster of the *Port Angeles Evening News*, and Mrs. Webster gave us the pleasure of a visit to the Academy recently. . . . ¶ Arthur Lange of the Stanford Grotto, National Speleological Society, exemplifies the vigorous young scientists who combine serious study with adventure in the exploration of caves. . . . ¶ Leon E. Salanave is astronomy lecturer at Morrison Planetarium.

D.G.K.

COPYRIGHT 1954 BY CALIFORNIA ACADEMY OF SCIENCES

## IN THIS ISSUE

EDITORIAL: <i>The Science Museum and Youth Today</i>	1
<i>On the Track of Man</i>	2
CONSERVATION: <i>Captain Meares' Olympus</i> . WELDON F. HEALD	4
<i>Portus Novae Albionis Rediscovered?</i> ROBERT H. POWER	10
SCIENCE LOOKS INTO IT: <i>Calving of the California Grays</i> RAYMOND M. GILMORE and GIFFORD EWING	13
<i>Early Olympian</i>	16
<i>Caves: New Science Frontier of the West</i> . ARTHUR LANGE	18
ASTRONOMY: “ <i>Realm of the Nebulae</i> .” LEON E. SALANAVE	26
REVIEWS	28
FROM THE READER	31



THE  
COVER  
COPY

*Makah naha, tenas papoose kopa lacaset*—or just simply, Makah mother with her little baby in a box, in what purports to be Chinook jargon. Photo taken on the Olympic Peninsula, Washington, 50 years ago by S. G. Morse. See pages 16-17. (Courtesy *Port Angeles Evening News*)

**PACIFIC DISCOVERY** is published bi-monthly at Gillick Press by the California Academy of Sciences. Publication office: 2057 Center Street, Berkeley 4. Editorial and Advertising offices: Golden Gate Park, San Francisco 18. Subscriptions: \$3 per year; single copies: 50c. Members of the Academy subscribe through their dues. Entered as second-class matter, February 17, 1948, at the Post Office, Berkeley 4, California, under the act of August 24, 1912.

## The Science Museum and Youth Today

SCIENCE MUSEUMS of half a century ago were quite different from those today. Their dim corridors contained dusty assemblages of badly mounted animals from various corners of the world, rows on rows of mounted birds in glass cases with walnut frames, collections of sea shells and corals, and articulated skeletons in serried ranks. Yet among even these dubiously attractive exhibits of nature's handiwork as preserved and arranged by man, small boys wandered with eager curiosity, and many an active lad was stimulated with the desire to visit far foreign places, and to see with his own eyes the reindeer on its native steppes, the zebra on its native veldt, the toucan in its tropical forest, or the condor on the wing high over the Andes. Of such youth were scientists and explorers made.

Today the world has changed. Distance has been conquered. The farthest corners of the earth are but a few hours away. The North Pole, long the goal of the hardiest and most intrepid adventurers, is now flown over almost every day by weather planes. The old frontiers have closed in upon us, and become close at hand; their adventure is mostly of the past. The new frontier is that of the human mind, of intellectual adventure.

There are still, it is true, frontiers of physical distance — frontiers of space to conquer. The 200-inch telescope on Palomar Mountain — in its way the greatest physical instrument ever constructed by man — looks out at suns so far away that their light which reaches us today has been traveling since long before the advent of the human race.

Travel by men through interstellar space may indeed some day be possible — it is not unlikely that within twenty-five to fifty years there will be a successful journey to the moon, and the possibility of journeys into more distant space should not be discounted. Once the initial difficulties have been overcome, scientific advances proceed in immense strides. Two hundred and fifty years ago there were no steam engines; one hundred years ago there were no automobiles; seventy-five years ago there were no electric lights; fifty years ago there were no airplanes; twenty years ago atomic fission was unknown. Technological advancement strides along in seven-league boots once scientific research has pointed the way.

But any specific technological advancement is only an incident in the history of mankind — like the discovery of fire, like the invention of writing, like the harnessing of steam or electricity. When Lindbergh first flew across the Atlantic, millions of people hung breathless waiting for news of his success or failure. Now anyone flies across the Atlantic any day, or across the Pacific if he prefers a wider ocean. When the first successful journey is made to the moon, it will similarly be big news;

very shortly thereafter, however, it will be possible for anyone planning his vacation to go to the nearest travel agency and decide whether he prefers to visit Mauna Loa or the Craters of the Moon. There will be a difference in tariff unless or until the moon becomes a popular tourist resort.

Technological advancement becomes commonplace once the primary object is achieved and the means thereto have been improved or perfected. But the intellectual process which leads to technological advancement is one of the priceless assets of the human race. It has led man step by step from savagery to the civilization he enjoys today. It can lead him step by step to a civilization compared with which our own will seem little more than savagery.

But it is important not only that man should advance himself technologically; his technological discoveries are useless, even worse than useless, unless they advance the entire welfare of mankind. The discovery of fire was important not because it warmed the human body — animals get along comfortably without fire — but because it warmed the human spirit. It gave to primitive man the fireside by which he could think and dream, and it gave him a torch to light his way in the darkness.

We are faced today, in our opposite hemisphere, with a gigantic system that seeks to mould the hearts and minds of men into the service of an all-powerful state; that studies truth not for its own sake but to bend it to the purposes of propaganda; and that offers to youth, not the joy of free inquiry, but at best the blandishments, at worst the coercion, of turning its intellectual talents to the service of an "ordered society" — a society ordered by a self-selected few, not by the combined will of free men.

In such a situation it is doubly important that we should keep alive in our own midst, in the youth of today, who are the leaders of tomorrow, the spirit of intellectual adventure for its own sake, of scientific exploration and invention because it is fun, and of research for no other reason than to discover truth.

In this endeavor there is no finer collaborator than the Bay Area Science Fair, held this April at the California Academy of Sciences, and one of many similar science fairs held annually throughout America. Students are encouraged to use their ingenuity and inventiveness, to apply their knowledge of the laws of nature, and to exercise their talents in useful and forward-looking ways.

Museums today, while they must maintain their function as repositories of the past, are no longer dim, dusty corridors leading backward through time. They are a vigorous and vital factor in the contemporary world, and a symbol of the constant search for the truth that makes men free. R.C.M.

**E**N ROUTE [to the famous Altamira Cave with the Abbé Breuil] we visited . . . two of the most famous prehistoric caves in France. In the first we went a short distance by rowboat, then scrambled over banks and through the 'chimney,' a narrow tunnel with two bends. Deep inside we walked in single file, stopping to see the naked footprints of the Magdalenians still preserved in the damp clay. Here indeed was the Track of Man. . . ."

And there was Henry Field, anthropologist, in the lifelong process of realizing the dream of his twelfth birthday — to track mankind through the archeological dusts of its many ages — as he tells it in his autobiography, *The Track of Man*.

The wish to know who one's ancestors were and what they did is a universal human trait, observable equally in a Polynesian priest chanting the rote of past chieftains and their exploits and in a devotee of some New England genealogical society. Western civilized man has generalized this ancestor-obsession into the burning wish to recapture the whole history of the human race. Science is on the track of man, and knows many ways to follow it.

Henry Field, of the Chicago Fields, writes entertainingly of the adventuring life that has taken him along this track, from the Saxon site on his stepfather's English estate to the many-layered mounds of Mesopotamia and back to the caves of France and Spain, and even to the villages of the Caucasus and of Mexico's Sierra Madre. Correlating archeological relics of the long dead with measurements and material culture of the living, he has sought man's track through time by the techniques of anthropology and recorded it in his monographs for science and in the famous Halls of Man in the Chicago Natural History (formerly Field) Museum for all of us to see. These splendid exhibits of Stone Age man and the Malvina Hoffman figures of the Races of Mankind fulfilled the dream of Henry Field. Much more awaits the reader in his delightful book than can be even hinted at here.

The track of man is sown with weeds! The humble herbs of the dooryard, the palms, the various fruits and grains, the legion of "plants that have been with us since the Stone Age, that may have even come into being under our influence, that have shaped our own destinies, will give us the data from which we can write the story of man." A botanist is speaking, but one who is equally familiar with history, geography, and anthropology, Dr. Edgar Anderson of the Missouri Botanical Garden in St. Louis. He is widely known for his outstanding work in the baffling history of maize, and his recent book, *Plants, Man, and Life*, just quoted, has been enjoyed alike by his fellow scientists in many fields and by lay followers of scientific discovery who have found it a rare reading adventure.

Edgar Anderson's specialty is measuring the differ-

ences between one race or species of plant and others close to it, then seeking, in plotted figures, clues to the plants' origins and subsequent history, with particular regard to the part man may have played. This is coldly put; the warmth comes in Dr. Anderson's telling—what he learned of the origin of agriculture from the efficient disorder of a Mexican peon's garden; his realization, while measuring maize in a sunlit patio, that "insight into the daily life" of the family, going quietly on around him, "was probably even more valuable than my precious statistics." For Dr. Anderson is above all human, and is ever ready to see the human side of the story cropping out in the most abstruse taxonomic investigation. Far from abstruse are his comments on some taxonomists — the fact that many today "deliberately avoid studying or even collecting" cultivated plants gives rise to "the great paradox that our commonest plants are the least known." But as to their importance, Anderson can say, apropos of the fennel, radish, wild oat, and other Mediterranean plants that cover California's coastal hills, "they were old when Troy was new. . . . Theirs is a long and complicated story, a story just now beginning to be unraveled but about which we already know enough to state, without fear of successful contradiction, that the history of weeds is the history of man."

Anderson's so very engaging book is dedicated to three men "who turned my attention in this direction," and it is no surprise that one is Carl O. Sauer, distinguished chairman of the University of California Department of Geography. For Dr. Sauer gave at Columbia in January and February of 1952 the Isaiah Bowman Memorial Lectures published under the title, *Agricultural Origins and Dispersals*. Much of the thinking and work here summarized had indeed inspired the horticulturist Anderson. The geographer Sauer has long been avidly tracking man through his vegetables and, being an original thinker, has come up with some theories at variance with the commonly accepted. The presence of grassland or woodland is conventionally laid to climate; Sauer credits man with greater effect upon regional variations in the types of plant cover than most ecologists do, and ascribes greater antiquity to man's influence as agent of change in his surroundings. He puts the beginning of agriculture "several times" the "seven thousand years in the past" of general acceptance, and he believes it occurred in wooded hills rather than in grassy plains. Archeologists seek the first farmers in the Late Stone Age of the Old World. Sauer says: "The Neolithic opens with a well-established agriculture, and a rather full complement of the crops and animals still basic to the Old World. The great, long, and tedious job of domestication was done before then."

No men have left plainer tracks than the artists of the race. Craftsmen have shaped stone, incised bone,



## Through Some Recent Books

painted and engraved upon the walls and ceilings of caves. Relative, if not absolute, age can be ascribed to the geologic formations in which the products are found. The consummate examples of prehistoric art so far known are the famous cave paintings of France, Spain, and Africa, which belong now with the great art of all ages. Pioneers in bringing them to present light were such tireless enthusiasts as the Abbé Henri Breuil, whose *Four Hundred Centuries of Cave Art* is a product of incredible labor, and the late Professor Hugo Obermaier, who inspired the more readily available, less specialized, and utterly beautiful book, *Art in the Ice Age*, under the authorship of Johannes Maringer and Hans-Georg Bandi. Here in superb format are not only the greatest of the cave paintings, engravings, and sculptures, but also the separate figures in stone, bone, and horn, along with adequate text describing and evaluating the works and summarizing what is known of the life and times of the peoples who produced them. This is the track of prehistoric man upon his pinnacle of achievement. The book itself is a triumph of graphic art and science.

"What started people drawing such pictures at all? How did they come to take a piece of charcoal in hand and draw the outline of an animal?" the anthropologist Dr. Gene Weltfish asks in her book, *The Origins of Art*. To find answers she has spent most of her post-graduate life among living peoples whose direct links with the past are not wholly obscured by the increments of civilization. The way an Indian designs and makes a basket is much the same as the first basket-maker's way. To know how and why he (or she) does it — where tradition still prevails — is to know something about the earliest craftsmen and so to discover more of the track of early man. For "it was as a tool-maker that man first became master of the animal kingdom." In the symmetry of a chipped flint hand hammer, perhaps a thousand centuries before the cave paintings, design was born. Art sprang from industry, and in this context Dr. Weltfish traces it down.

Our tracks so far in this hasty glance have been those of man fully evolved in the form we ourselves have inherited. The cave painters were our direct ancestors. What do we know of human beginnings and how did we come to know it? The question so intrigued Ruth Moore, a journalist, that she traced this knowledge through the exciting history of the science of evolution and came up with a book, *Man, Time, and Fossils*. This book has already been praised by calling it equal to *Gods, Graves, and Scholars*, and indeed it is.

"Darwin had no sooner published his *Origin of Species*, with its implication that man is descended from an earlier, simpler form than his outraged critics demanded proof. . . . And then the search began, the search for man's predecessor. It was to be an exploration as adventurous and as full of incredible happen-

ings as the search for gold. . . ." This search, and the parallel search for the *mechanisms* of evolution, are Ruth Moore's story.

She begins with Darwin's own progress from the wonder at things seen on his voyage around the world to the certainty of things deduced that led him inevitably to his theory of evolution through natural selection. After giving Lamarck his due—the "speculations" of Darwin's forerunner "were uncannily sagacious" — she proceeds to his anti-Darwin champion Giard who nevertheless won France for evolution; to Cope, the American who filled museums with his vast pioneer collections of fossils; to De Vries and Mendel, whose experiments discovered mutation and the laws of heredity. Then came Haldane, Fisher, and Wright, the three who "saw and proved that both Darwin and the mutationists were right."

With evolution firmly established, there remained, on the track of man, the search for the "missing link" to prove man's own origin from pre-human forms. One after another came the startling finds: Neanderthal man, definitely human but pointing to something earlier; then from Java, *Pithecanthropus erectus* — the missing link, but how controversy raged! Then came *Sinanthropus*, Peking man, and apparent confirmation. But it remained to South Africa to give to an eager world what could first truly be called an "ape-man." The work of Dart and Broom brings us up to 1950.

Time is the closing theme of the book. How old is the earth, how ancient is man? Uranium, Carbon-14—such tools of modern research are yielding answers. Earth is older, man younger, by latest counts — but the end of the Track of Man is still earth's secret. D.C.K.

**Plants, Man and Life.** By Edgar Anderson. Little, Brown & Company, Boston. 1952. 245 pp., line cuts. \$4.00.

**Four Hundred Centuries of Cave Art.** By Abbé H. Breuil. Translated by Miss Mary E. Boyle. Realized by Fernand Windels. Centre d'Etudes et de Documentation Préhistoriques-Montignac, Dordogne. (Printed in Paris, 1952.) 417 pp., 530 line and halftone figs., 6 color plates, several maps. \$25.00 (limited edition).

**The Track of Man: Adventures of an Anthropologist.** By Henry Field. Doubleday & Company, Garden City, New York. 1953. 448 pp., 28 photos, endpaper maps. \$5.95.

**Art in the Ice Age: Spanish Levant Art; Arctic Art.** By Johannes Maringer and Hans-Georg Bandi in execution of a plan by Hugo Obermaier. Frederick A. Praeger, New York. 1953. 167 pp., 216 line, halftone, and full color figs., endpaper maps. \$12.50.

**Man, Time, and Fossils: The Story of Evolution.** By Ruth Moore. Alfred A. Knopf, New York. 1953. xvii + 411 + xiii pp., 71 line drawings, 62 halftones. \$5.75.

**Agricultural Origins and Dispersals.** By Carl O. Sauer. The American Geographical Society, New York. 1952. v + 110 pp., 4 folded insert maps in 2 colors. \$4.00.

**The Origins of Art.** By Gene Weltfish. The Bobbs-Merrill Company, Inc., Indianapolis and New York. 1953. 300 pp., 99 plates of line drawings. \$4.50.



## CONSERVATION

# CAPTAIN MEARES' C

**W**HEN British Navy Captain John Meares under Portuguese orders sailed his barkentine *Felice* up the Pacific Coast in 1788, he was particularly impressed by a group of great snowy mountains. He christened the highest peak Mount Olympus, declaring that *there* was a home fit for the gods.

Captain John named better than he knew. For Zeus, supreme diety of the Greeks, was god of the bright sky, thunder, rain and snow, and this new-world Olympus in the center of Washington State's Olympic Peninsula presides over the rainiest area in the United States and, so far as is known, it receives the greatest snowfall on earth.

Each winter a vast depth of snow wraps these Olympic Mountains in a soft white embrace. And they are also one of the largest areas of primeval wilderness left in the country, and by far the most beautiful. Here is a land of snow- and ice-clad peaks rising in splendid confusion above deep, twisting valleys, and clothed in a sweeping circular skirt of magnificent virgin coniferous forests, 50 miles wide and over 200 miles around the hem. More than fifty glaciers mantle the summits and stream down the mountainsides in cataracts of blue ice, and everywhere pour silvery cascades from the melting snow to join the turbulent rivers in the valleys' depths. Sparkling emerald lakes

*Washington's sea-girt alpine wilderness is "a home fit for the gods" and a perpetual inspiration to men*



# S' OLYMPUS

WELDON F. HEALD

PHOTOGRAPHS BY THE AUTHOR

and exquisite wildflower meadows are perched high up under the snowfields, while the forests below cover every valley and slope with an almost impenetrable jungle of evergreens and moss-grown underbrush.

These superb, untamed mountains are one of nature's last American strongholds where life has gone on undisturbed since the beginning of time. Deer, bear, elk, and nearly sixty kinds of smaller animals and nearly two hundred species of birds go about their business, unafraid of men. Herds of giant Roosevelt elk proudly roam the forests and meadows, fully aware that they are the sovereigns of this wilderness realm. Most of original America

has disappeared in the 166 years since the *Felice* sailed the seven seas. It was a priceless heritage that we have recklessly squandered. But Captain Meares' Olympus still stands as a superlative monument to the land we lost while winning it.

From the moment I first saw the clustered white peaks of the Olympics, floating like a bank of clouds above the blue waters of Puget Sound, they cast a spell over me. But a side trip was not on my schedule and furthermore I had little time and no equipment. However, these are trifling hindrances to one whom the gods have called and I went anyway. Nobody was ever less prepared for the wilderness than I on my first journey to Olympus.

**Left:** Snow peaks line the mile-deep Elwha River valley above forests of huge firs and cedars, in the Olympic National Park, Washington. (This and the view opposite are not a continuous panorama.)  
**Right:** Queets Basin, Olympic National Park. Magnificent forests, deep valleys, and glacier-bearing peaks make this park a vast primeval wilderness of spectacular grandeur.





One quick and easy way to reach the high places of the Olympics on foot is from forest-bordered Quinault Lake, at the southern base of the mountains. The road ends a few miles above the lake and a trail leads up the North Fork of the Quinault River to its head at Low Divide. In the days of my first pilgrimage to the snowy Olympian shrine a log chalet provided limited accommodations at Low Divide and a rough, shake-walled half-way cabin was maintained a few miles up the trail. These were discontinued after the Olympics became a national park with a policy of keeping the wilderness inviolate. But their presence then permitted me to walk unconcernedly through the wilds with only a toothbrush in my pocket.

The trail immediately plunged into the forest and the mountain walls closed in on both sides, forming a deep green corridor through which the North Fork churned and foamed between solid ranks of giant trees. I traversed twilight aisles among great cedars and firs, eight to ten feet in diameter. Ferns and underbrush grew in near-tropical luxuriance beneath the trees and a thick carpet of velvety moss covered rocks and fallen logs. Even the air was redolent of damp earth and the fresh, clean fragrance of growing things.

These Olympic forests are almost unbelievable in their rank exuberance. They contain 18 billion

The permanent but ever-melting ice and snow of the peaks . . .

board feet of growing timber, cover an area larger than Rhode Island, and vary through three altitudinal climate zones from Douglas firs, 17 feet in diameter and 300 feet high, to stunted wind-blown alpine firs at timber line. Unique are the so-called "rain forests" in the lower river valleys of the western slope. There 145 to 150 inches of rain annually, falling almost continuously during the winter months, have brought forth an incredible mass of vegetation. Heavy stands of Douglas firs, Western red cedars, Sitka spruce and Western hemlocks interlace their branches 150 feet above the ground and filter an eerie, sun-dappled, green half-light into the glades below. Under them is a mezzanine floor of clean-boled, broadleaf maples, themselves a hundred feet high, and finally an understory of moss-draped vine maples, devils club, ferns, and other jungle-like growth. The rain-forest floor is a cushion of moss, six inches thick, over many feet of rich, damp humus.

How does it happen that these remarkable Olympic Mountain forests have survived, surrounded on all sides by some of the most wasteful and destructive lumbering operations ever practiced in America? Chiefly, some good luck, a large amount of foresight, and plenty of straight, hard fighting on the part of conservationists and public spirited citizens have kept this magnificent remnant of wilderness America from being completely destroyed.

The first move in the right direction was back in 1897 when President Cleveland set aside some two million acres on the Olympic Peninsula as a forest reserve. One fifth of this area was eliminated for lumbering four years later, but the remainder, including the mountainous section, became Olympic National Forest in 1907. One abortive attempt to establish a national park to protect the rare Roosevelt elk failed in 1904, but President Theodore Roosevelt came to the rescue of his cervine namesakes by creating Mt. Olympus National Monument in 1909. This originally comprised more than 600,000 acres, but was reduced to less than half by President Wilson when lumber was badly needed during World War I. A second vigorously conducted five-year campaign succeeded when Congress passed the Wallgren Bill in 1938 establishing Olympic National Park. With an area of 896,600 acres, it is the nation's fifth largest.

Administered by the National Park Service, with headquarters at Port Angeles on the north border, the Olympics are now being maintained in the



... make the dense stands of cedars, firs, and hemlocks.

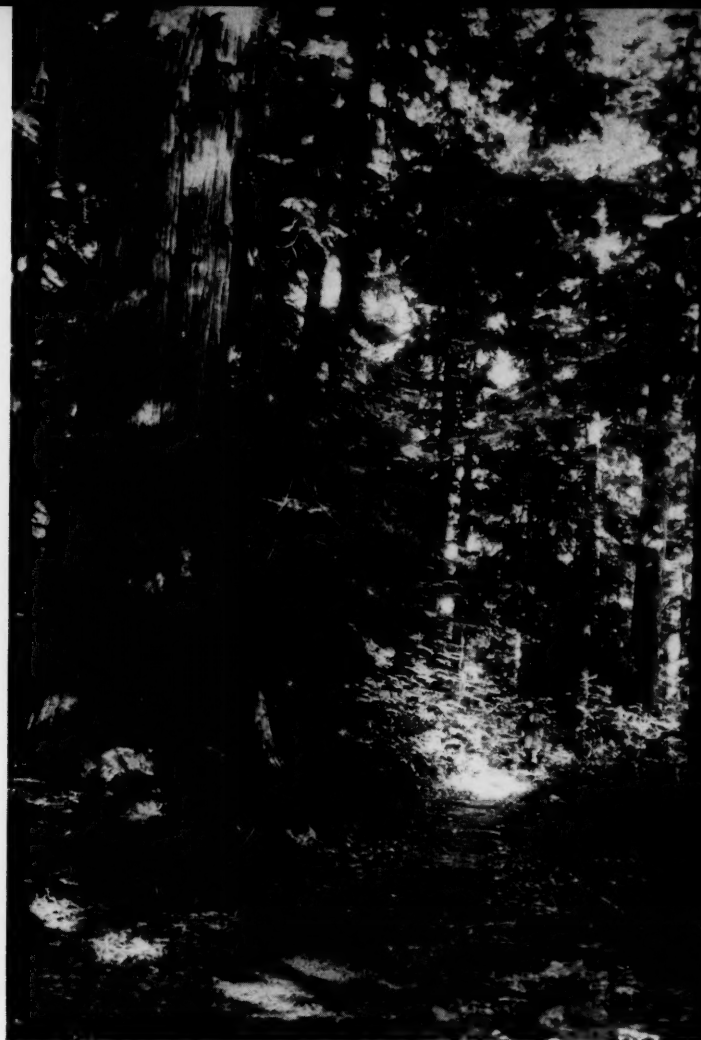
most natural state possible. No roads will be built into the interior and a minimum of development is permitted within the park boundaries. However, 580 miles of riding and hiking trails make a large part of the mountain area accessible and the Park Service has constructed bridges and trail-side shelters with bunks and stone fireplaces. So today, the Olympics are a friendly sort of wilderness, easy to explore and enjoy with little effort or hardship.

But no longer can you arrive at Halfway House as I did on that August noon and be met by the doleful, long-faced caretaker. He talked little, but as he heated a can of beans and some frankfurters for my lunch he sang a lugubrious, tuneless song of many verses.

Beyond the cabin, the trail, always rising, penetrated deeper into the narrowing valley of the North Fork. Rocky pinnacles spotted with patches of snow began to appear through the tree branches above and at frequent intervals little streams came tumbling down through dark green tunnels in the forest. The last part was a long, 2,000-foot pull, zigzagging up the east slope of the canyon to Low Divide, 3,602 feet elevation. Here you pass in a few miles from the Transition Zone, through the Canadian, to the Hudsonian Zone, and the character of the vegetation changes sharply. Up here, at last, were the snow-peaks, and the approach to Low Divide was through an exhilarating alpine meadow, bright with hosts of wildflowers and bordered by groups of spiry alpine firs, feathery mountain hemlocks and Alaska cedars.

Late in the afternoon, 13 long miles from the road, I came to the log chalet near the top of the pass. I found a caretaker and three men from Seattle there, but just before my arrival the cook had suddenly and unaccountably vanished. We all took a hand with the steaming pots and pans he had left on the stove and ate heartily in spite of our puzzlement. After supper the worried caretaker went out to investigate the mystery. He found the cook camped up the trail ready to head for the trackless wilds in the morning. He had taken one look at me approaching without pack or mountain equipment and assumed I was a determined deputy sheriff come to arrest him for non-payment of his back alimony. The misunderstanding was smoothed out and the cook, carefree once more, whistled over his dish-washing as the setting sun turned the snows of Mount Christie to a glowing pink.

MAY-JUNE 1954



Along the Quinalt Trail.

Low Divide is a delightful base from which to explore the mountains to the east and west. The next morning I wandered up through clumps of alpine trees and flowery meadows to Martins Park, a high-perched little valley under the glaciers of Mount Christie, dotted with shining miniature lakes, some of them still frozen. I ate my lunch atop a sharp skyline ridge, with a mile-long sweep of crevassed ice behind me and the slope at my feet plunging down 3,000 feet into the green forested valley of the Elwha River.

The second day one of the men from Seattle and I climbed Mount Christie. The top, 6,250 feet elevation, is a narrow, splintered shale and quartzite ridge thrust up between glittering fields of snow and ice. Here, a breathtaking expanse of peak, valley, and glacier spread around us like the foaming waves of an angry sea, and twelve miles



Lake Mary on Low Divide in the Olympic National Park.

northwest towered the triple-topped, ice-sheathed bulk of Mount Olympus. On Christie we traversed broad névé fields, looked into glacial crevasses walled with blue ice, and glissaded down long snow slopes. I felt, at last, that I had entered the vestibule of the Olympic gods. But I wanted to penetrate the inner sanctum.

By this time the cook and I were on excellent terms. I borrowed his sewing kit to make a pack out of a gunny sack with two folded burlap strips for shoulder straps, then cajoled him into supplying me with a few cans of soup and beans, and a couple of blankets. So the following afternoon I took the trail over Low Divide, past charming little Margaret and Mary lakes, then down the north side, 1,100 feet into the depths of Elwha Valley.

It was a bright sunny afternoon, the forest views

were enchanting, but never before nor since have I carried such a fiendish abomination as that homemade pack. It rode my shoulder blades, bouncing vigorously up and down, while the straps sawed raw grooves in my skin. Each can thumped and prodded my back, and every time I stopped to rearrange the pack the load became heavier, more ill-balanced and uncomfortable. So I finally settled down to a grim, miserable plodding pace which got me to the bottom, across the Elwha on a huge fallen log, and to a camping place of sorts on a sandy beach between forest and rushing river.

Three miles beyond, the valley widened out into Elwha Basin, a green, heathery meadow cupped in a giant amphitheater formed by the snow-capped peaks of Mount Seattle, Mount Meany and Mount Queets. The grass sparkled with dew and fat marmots whistled shrill greetings from

the tops of flat rocks as I passed. Intending to camp here upon my return in the evening, I left the infernal pack hanging from a tree limb safe, I hoped, from four-legged prowlers.

The friendly trail petered out in the basin and the next part of the journey was a 2,000-foot pull up the famed "Elwha Snow Finger," a narrow deposit of snow that fills the bottom of upper Elwha Canyon for a distance of two miles. In places winter avalanches had piled the snow to depths of 100 feet or more and compressed the bottom layers into solid ice. The river flows through a channel beneath the snow and at one point had cut a perfectly arched ice bridge, 75 feet high.

Two hours labor up the hard-packed snow, with a broiling sun pouring into the narrow canyon, was finally rewarded. At the top of the snow finger is 4,850-foot Dodwell-Rixon Pass, and over the west side suddenly appeared the beautiful, bowl-like Queets Basin — by all odds the finest high mountain valley in the Olympics. The view extended from a semi-circular rim of rocky peaks, draped with gleaming glaciers and snowfields, down across the gracefully curving green basin and into the deep forested canyon of the Queets River, almost to the Pacific. And over the rim to the west peered the tip of Mount Olympus, now only five miles distant.

Another hour up the ridge to the east put me on the summit of Mount Barnes, 6,030 feet altitude. Here was a front-row, grandstand seat looking over the Queets Basin ridge into the spectacular playground of the snow gods — a dazzling, silent, arctic domain of ice, snow and rock, dominated by the lordly white Olympus against the blue sky. From the smooth, undulating topmost snowfields great ice-falls poured down its flanks and hung in steely blue cliffs above dark rock precipices, while on all sides a score of glaciers mantled the peaks.

It was a scene that could have been among the highest mountains of the world, and the sense of the enormous burden of grinding snow and ice was almost overpowering. Yet Olympus is only 7,954 feet high. It is topped by dozens of peaks in Washington's Cascade Range, across Puget Sound. But none can equal the prodigious winter snowfall that clothes this relatively low mountain in a shining mantle of ice 13 square miles in area and hundreds of feet thick. Seven major glaciers descend its slopes and push their tongues far down into the valley forests. Largest is the Hoh Glacier which is four miles long and ends at an altitude of

only 3,500 feet, but the Blue and White glaciers are almost as extensive and equally impressive. Altogether there are probably 25 to 30 square miles of perpetual snow and ice in these mountains, and it is the combination of this sparkling alpine realm in close proximity to dense, lush vegetation that gives Olympic National Park its distinctive charm and fascination.

But apparently Zeus and Hera were not at home that day, as I saw no sign of life anywhere in that vast jumble of peaks and valleys around me. I don't know how long I stayed on top, but a westerling sun finally warned me to get down to Elwha Basin before dark. However, I left reluctantly, for after several hours amid such lofty, god-like surroundings, it seemed somewhat anticlimactic to descend the mountain to my cans of soup and beans. I was more in the mood for nectar and ambrosia borne by a Ganymede shod in tricouninailed climbing boots and carrying an ice-ax.

But it was men, not gods, after all, that saved me from such an ignominious let-down. When I slid off the lower end of the snow finger, I saw a thin pencil of blue smoke rising into the still air above Elwha Basin and several horses were grazing peacefully on the meadows. A party with a pack train had arrived and as I approached their camp I caught the crisp, tangy aroma of hot biscuits. They were three couples from Portland, Oregon, taking a ten days' vacation trip through the Olympics and, with true wilderness hospitality, they invited me to supper. This welcome surprise meal was one of the best I've ever had in the woods.

After a companionable session around the campfire, I rolled up in my blankets and looked into the starry sky with a feeling of vast contentment and well being. Around me the mountains rose jet black, mottled with a ghostly pattern of snowfields. The only sounds were the muted roar of the distant river and the tinkle of a cow bell on one of the party's horses. Day after tomorrow, I thought, I'll be headed back to the city, crowds and responsibilities. That is our normal lot in life. But I gave thanks to those stalwart souls who realized the stimulating spiritual and physical influence of the wilderness as an antidote to the pressures of modern civilization. There is but little left and that is dwindling fast. So it is up to us to fight in our turn to preserve such superlative samples of original America as Olympic National Park, and hand them down as a priceless natural heritage to the generations to come.



# Portus Novae Albionis REDISCOVERED?

By  
ROBERT H.  
POWER

FRANCIS DRAKE sailed away from the California coast on July 23, 1579. The place of his landing and departure has since been lost to history. Though every means of historical research has been used and several points are claimed, no sufficient evidence has yet appeared to prove the case for any particular one. The port of Nova Albion has eluded all searchers.

The first tangible evidence of Drake's visit to our coast was accidentally discovered in 1936 by Berle W. Shinn. Near Greenbrae, Marin County, California, in latitude 37°56' he picked up the plate of brass upon which Drake had inscribed his claim to Nova Albion for Queen Elizabeth "and herr svccessors forever." The Plate of Brass has been authenticated by experts, but no one can say Indians or white men had not moved it from where Drake nailed it to a post 375 years ago. Authorities, in fact, have thought it so likely to have been moved they have attached little importance to the place where it finally turned up, although because of it there has been some recent speculation upon San Francisco Bay as the anchorage of the *Golden Hind*. Drakes Bay, however, is still the locality most favored, with Bodega Bay second choice.

Consider for a moment the odds against the possibility that anyone would pick up this piece of brass 20 to 40 miles away at another bay and then drop it on the shore of the bay — the logical one I believe — where it was found. Certainly the Greenbrae location of the find should be treated as a significant fact, which authorities agree would be of great value if only it can be coupled with other facts.

The other clues every searcher must work with in the quest for Nova Albion are a border map on the Hondius broadside map of the world entitled *Vera totius expeditionis nauticae* (1590?); published accounts of Drake's voyage, such as *The Famous Voyage of Sir Francis Drake into the South Sea* (1589) and *The World Encompassed by Sir Francis Drake* (1628); and remarks by John Drake and others.

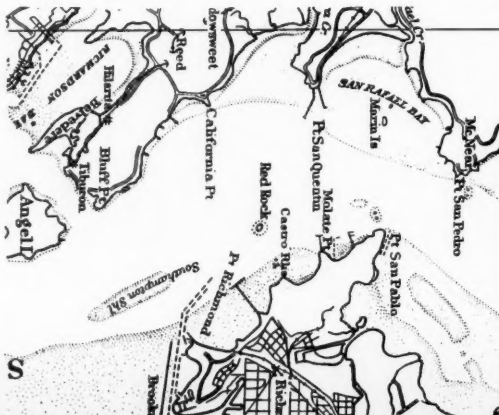
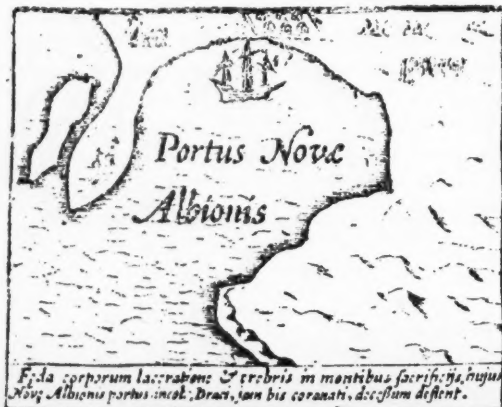
There is almost complete agreement that the Port of Nova Albion is in either Sonoma or Marin County because accounts of the voyage clearly state that the anchorage was near the 38th parallel, which crosses Marin from Drakes Bay to a point north of San Rafael and on across the southern end of San Pablo Bay. Also, the Plate of Brass was found in this geographical area.

The Dutch cartographer Jodocus Hondius compiled his broadside map after the voyages of Drake and Cavendish around the world. The decoration and text on the map, however, are confined to Sir Francis Drake and his voyage. On the west coast of North America on the Hondius map at approximately 38° latitude is a large inlet which is the Port of Nova Albion, and as a part of the border decoration there are three inset detailed plans of ports that Drake visited, one of them a bay called "Portus Novae Albionis." The source of these plans may have been the log of the *Golden Hind*, a document long lost. Two of them have been identified and found to be quite accurate. But the plan in the upper left corner of the broadside, the "Portus Novae Albionis," has never been satisfactorily oriented in California.

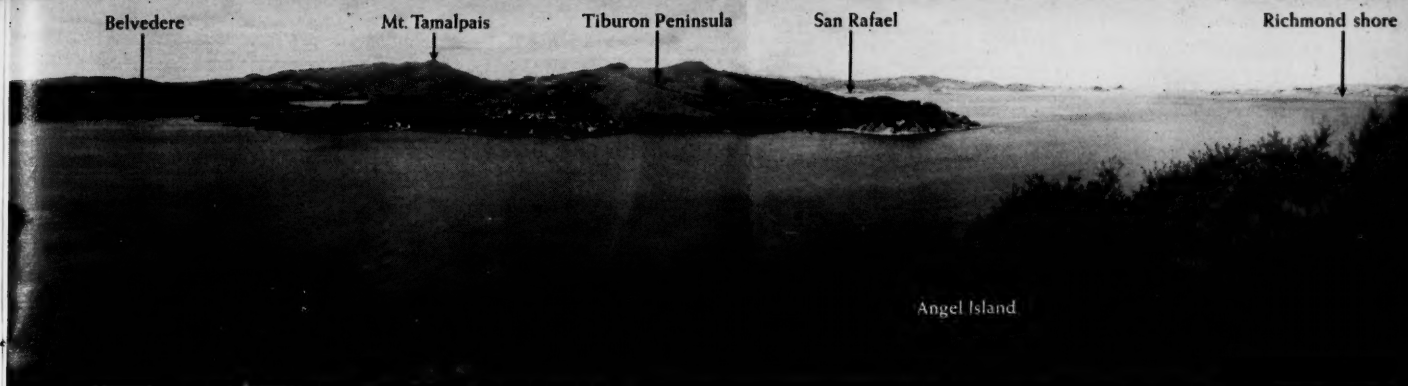
My quest to rediscover the Port of Nova Albion was begun by tracing the Hondius plan and then laying it over the geographical features of the Marin shore on a modern map. The greatest difficulty was in the lack of scale on the Hondius plan. But regardless of scale, those features of the plan consisting of a peninsula and an island resembled only Tiburon Peninsula and its island-like neighbor, Belvedere. Therefore I drew the peninsula on the Hondius plan on the same scale as Tiburon Peninsula on the modern map, and then copied the rest of the plan on the same scale so that the entire area on both plan and map could be compared. When the Hondius plan was again laid over the features of modern Marin, it encompassed an area from southern San Pablo Bay to Angel Island, and from San Rafael to Richmond. This brought the entire Hondius plan into essential agreement with the modern map.

The island and peninsula correspond to Belvedere and Tiburon. The *Golden Hind* is drawn where San Quentin Point should be. The rest of the inside shore of the bay corresponds to the San Rafael shore, the near-straight line corresponds to the straits of San Pablo, and the far shore compares favorably with the Richmond coast line. And, equally important, we find the tracing overlaps the 38th parallel by one half minute, and one edge of the Hondius plan parallels and nearly corresponds to the 38° latitude line. If northern San Francisco Bay is "Portus Novae Albionis," then the cartographer oriented his map with the latitude and longitude of the globe.

The Hondius plan (left) and part of U.S.C. & G.S. Chart 5502, with the 38th parallel at right. West is up. The photo opposite, taken from Angel Island, subtends an arc from Belvedere to the tanker docks near Pt. Richmond.







(CAS photograph by George W. Bunton)

Why, then, did the cartographer ignore San Quentin Point, Angel Island, and San Pablo Bay? First, it is obvious the plan was drawn by sight from a single point. I asked a designer where he thought the draftsman stood when he sketched the plan. He quickly indicated a point off the end of the peninsula on the Hondius plan, basing his decision on the angles of the village stockade or fence shown on the plan and on the position of the Indian shown on the peninsula. A look at the present map strongly suggests that Angel Island is the very place where Drake's draftsman sat to draw the Port of Nova Albion 375 years ago.

As seen from Angel Island, the Port of Nova Albion has not changed in outline since 1579. Belvedere and Tiburon are both clear, but the details of the peninsula are not; therefore only a generalized coast was possible. San Quentin Point and the San Rafael coast blend into a gentle curve. The Straits of San Pablo allow only a restricted view of San Pablo Bay, which is far too distant to be drawn by sight from Angel Island. The Richmond coast is close at hand and in good perspective, making it significant that the same coast on the Hondius plan has more detail than any other portion, and in general agreement with the present outline of the Richmond coast. Also, it is reasonable to assume the artist might have omitted drawing the island from which he was making his sketch.

Consider now the odds that any other bay in Marin County has or ever did have a coast line similar to that of the Hondius plan; and consider also the odds in favor of a map that is almost geographically correct having borders parallel to true latitude and longitude lines. There is no other portion of the Marin or Sonoma coast that matches the Hondius plan so well. Moreover, Greenbrae, where the Plate of Brass was found, is within the area of the plan. These facts taken together strongly indicate that northern San Francisco Bay is indeed the Port of Nova Albion.

Before a conclusion can be drawn, however, the written accounts of Drake's voyage must be examined. *The Famous Voyage* gives a convincing indication that the *Golden Hind* was the first ship to sail through the Golden Gate, in these words: "... Till we came within 38 degrees towards the line. In which height

it pleased God to send vs into a faire and good Baye, with a good winde to enter same."

The combination "faire and good" emphasized with "it pleased God" can only be interpreted as meaning excellent. The words "into" and "enter" imply going through a restricted entrance, such as the Golden Gate, into a bay beyond. The need of wind indicates the entrance and bay were of some magnitude.

*The World Encompassed*, compiled from the notes of Drake's chaplain Fletcher, has passages that logically apply to San Francisco Bay. One of these states they rowed around for the first three days and then anchored the *Golden Hind* closer to shore. This again indicates a bay of larger size than Drakes or Bodega.

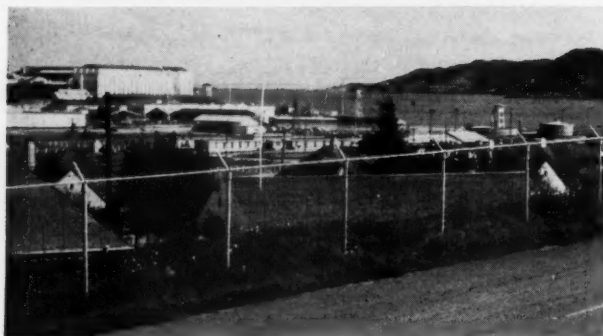
The same work also gives clues to terrain, flora, and fauna: "Besides how vnhandsome and deformed appeared the face of the earth itselfe! shewing trees without leaues, ground without greenes in those moneths of Iune and Iuly" (June 27 to August 2 by the modern calendar). "The in land we found to be farre different from the shoare, a goodly country, and fruitful soyle ... large and fat Deere, which we sawe by the thousands, as we supposed, in a heard; besides a multitude of a strange kind of Conies."

San Quentin Point is rather barren and rocky, the grass is brown in July, and the buckeyes in Marin begin to lose their leaves in early July. The inland description is definitely inland Marin, and it is a typical description of the hilly area north of San Rafael where there is an abundance of oaks and acorns, and therefore ground squirrels ("Conies"), and open grass where elk by the thousands once grazed.

The Hondius plan also shows several trees which greatly resemble oaks and it is the only illustration of Drake's landing which was probably completely drawn in Nova Albion.

The Indians described in both *The Famous Voyage* and *The World Encompassed* have definitely been identified as Coast Miwok by Dr. Robert F. Heizer and by Dr. A. L. Kroeber of the University of California Department of Anthropology. These accounts of California Indians in 1579 are the rarest treasure in the narratives because they are the earliest descriptions of Indians on the California coast. The Coast

▲ Angel Island was taken over by the Sixth Army on the day that the author and some Academy staff members landed there from the Academy's launch, and MP's kept the party from going farther eastward (to right in photo) where the view most nearly agrees with the Hondius plan. View across Raccoon Strait from Hospital Cove.



Miwok inhabited the Marin peninsula and were concentrated mostly at Bodega and San Francisco bays.

*The World Encompassed* states that the place of landing and the camp site were three quarters of a mile from an Indian village. No archeological evidence of Indian villages has been found on the south side of San Quentin Point, but there was one not far away on

Credits—*Top*: Courtesy University of California Press.  
*Middle two*: Courtesy Clinton Duffy, former warden, San Quentin Prison. *Bottom*: CAS photo by G. W. Buntton.

Corte Madera Creek. There is an indication that the Plate of Brass was erected on a "Firme Post" at an Indian village and not at Drake's camp.

John Drake, cousin of Francis, who was aboard the *Golden Hind*, gave the following deposition to his Spanish captors five years after the voyage: "Francis Drake, on this journey, saw five or six islands of good land. He called one San Bartolome, one San Jaime, and another which seemed to be the largest and best, Nueva Albion. He remained here a month and a half."


Many authorities have ignored or discredited John Drake's statement about Nova Albion, but it has more significance than would at first appear. He could have remembered Nova Albion (Marin) as an island, providing he sailed on three sides of it. His complimentary tone suggests he thought well of Nova Albion, along with his cousin Francis who considered it worthy of naming after his homeland.

One descriptive item in *The Famous Voyage* that has always been used in arguing in favor of Drakes Bay as the place of anchorage, reads: "Our Generall called this Countrey, Noua Albion, and that for two causes: the one in respect of the white bankes and cliffes, which lie towards the sea."

The key to this passage is in the words "lie towards the sea." If the cliffs had been at the place of anchorage, the word *bay* or *harbor* would have been used, not the word "sea." The coast of Drake's Nova Albion was from San Francisco to Oregon, but it was probably named for the nearly white cliffs that face the ocean from Marin's outer shore.

The last paragraph about Nova Albion in *The World Encompassed* has always confused those who favored Drakes Bay because of the illogical time element involved. It relates how the *Golden Hind* sailed out of the harbor July 23 and landed on some islands July 24. The Farallones are 17 miles from Drakes Bay — too close to fit this time table, given the prevailing summer wind on these shores. They are, however, 37 miles from San Francisco, a reasonable day's sail.

"The 23 of July they [Indians] took a sorrowful farewell of us. . . . Not farre without this harborough did lye certaine Ilands (we called them the Ilands of Saint James) hauing on them plentiful and great store of Seales and birds, with one of which wee fell July 24. whereon we found such prouision as might serue our turn for a while. We departed againe the day next following, viz. July 25."

The location of the Plate of Brass, the geographical features of the Portus Novae Albionis, and the narratives combine to allow the following logical conclusion: Francis Drake on June 17, 1579, sailed the *Golden Hind* through the Golden Gate and anchored in northern San Francisco Bay. Three days later, he landed and set up a camp, probably on or near San Quentin Point. 

The profile of Tiburon Peninsula looking south from San Quentin (*bottom*) startlingly resembles the distant land across the cove in the old engraving (*top*) of the Indians crowning Drake — but where is the high hill to the left? The drawing (*upper middle*) of San Quentin Prison about 100 years ago shows one; the later photo (*lower middle*) has it partly excavated. Our present photo shows the new cell block where the hill *was*. A 100-year-old map in prison files calls the hill a burial ground of the aborigines, places an Indian village on the cove, and says whaling ships were beached there! It was drawn by a Spanish captain.

THINGS we are sure of that turn out to be happily untrue add spice to the life of a scientist. We have recently had the fun of uncovering a fallacy in the well-publicized natural history of the California gray whale.

During the past century the annual parade of these enormous mammals, along the coast and past the headlands of southern California, has excited the interest and curiosity of casual shore watchers and conservationists alike. Indeed, before the days of the '49ers it was the gray whale that brought ships from New England around the Horn to the coast of California.

The animal has twice survived near extinction at the hands of whalers but has recovered each time, and now is annually seen in large numbers swimming close to shore, seeking shelter in lagoons and bays, in a migration that terminates in the desolate inland waterways of the Baja California desert. It is in these quiet waters, sometimes 20 or 30 miles from the open sea, that the cows give birth to their 12-foot calves and it is in these waters that the annual remating takes place.

After much patient study it had generally been agreed that the breeding range of the species was limited to a half dozen locations along the middle one-third of the Pacific coast of the peninsula and it was believed that the maximum population which could be supported was that which would fully exploit the restricted nurseries in this area. Although occasional stragglers were reported from other areas, little thought was given to the possible discovery of additional calving grounds, and the limits of the known breeding range have not been significantly extended since the mid-1800's.

Recently, however, we have had the good luck to find gray whales calving in small numbers in two entirely new locations on the eastern side of the Gulf of California along the coast of Sonora and Sinaloa, some 350 miles beyond the most southerly heretofore recorded nursery.

Seven years of study begun by Dr. Carl L. Hubbs of the Scripps Institution of Oceanography and pursued by him and by many coöperating scientists including ourselves, have involved ships, skiffs, dug-outs, aircraft and helicopters, as well as the examination of historic records and interviews with local fishermen. Insofar as these studies defined the breeding range of the gray whale, they may be summarized as follows:

*San Diego* and probably adjacent *Mission Bay* — once heavily populated, but now no longer entered, probably on account of the heavy boat traffic. In an earlier day the ladies of San Diego dared not be rowed across the bay to their favorite picnic site on North Island, because of the prevalence of gray whales spouting in the harbor.

*Bahía de Todos Santos*, with its Mexican city of Ensenada—now visited by occasional stragglers which do not stay to calve.

## Calving of the California Grays

*Bahía San Quintín* — the situation is similar to that at *Bahía de Todos Santos*.

*Bahía de Sebastian Vizcaíno*—heaviest concentration of whales during the breeding season. From the south-east margin of this bay, *Laguna Scammon* and *Laguna Guerrero Negro* (Black Warrior) extend deeply into the Vizcaíno Desert, and these lagoons are now the largest and most important calving nurseries.

*Bahía Ballenas* — extends into *Laguna de San Ignacio* which also is heavily populated.

*Estero* — just north of *Bahía Magdalena*; three entrances, *Boca Las Animas* at the north end, *Boca Santo Domingo* in the middle and *Boca Soledad* at the south; well populated, especially south of *Boca Soledad*.

*Bahía de la Magdalena* — a huge bay, perhaps once the most important of the calving and mating areas of the gray whale, now thinly populated, probably because of the rather heavy fishing traffic.

*Bahía de Almejas*—just south of and connected with *Bahía Magdalena*; well populated. Until recently this was thought to be the southernmost nursery.

This sums up the known winter range of the California gray whale. So far as the writers are aware, none of the lagoons north of Mission Bay have ever been frequented by calving grays within historic times, despite the apparent suitability of such protected bodies of water as Newport Bay, Anaheim Bay, San Pedro Bay, Morro Bay and especially San Francisco, Bolinas, Tomales and Humboldt bays.

To be sure, apparent stragglers have been reported from time to time in odd places, as for example the three cows with small calves which Hubbs saw on the northwest side of *Isla Guadalupe* on February 3, 1950. The small size of the calves makes it probable they had been born here some 250 miles offshore from their nearest known regular nursery in Scammon Lagoon.

Nevertheless, as our studies progressed from year to year certain facts began to emerge which caused us to wonder whether there might not be at least one other nursery not known to us. For one thing Charles Scammon,\* the famous whaler and chronicler of the gray whale, had written somewhat ambiguously that the gray whale never extended its migration south of 20° north latitude, but he nowhere stated categorically that whales were found this far south, nor said whether they were seen along the coast or far out at sea. We presumed he referred to accidental encounters, else more would have been known of these southern migrators. Nevertheless, such a southern limit was 3° or approximately 180 nautical miles south of the tip of Baja California, opposite Cabo Corrientes in the Mexican state of Jalisco.

\**The marine mammals of the north-western coast of North America*, San Francisco and New York. 1874. 319 pp., 37 pls. (page 22).

Raymond  
M. Gilmore  
&  
Gifford  
Ewing



While we flew in a small land plane twice in early 1953 for long hours along the desolate, sunbaked, uninhabited and rugged coast line of Baja California, Ewing was happily engrossed in piloting the plane, while Gilmore had time to contemplate Scammon's cryptic remark. The annual census taken by Hubbs had shown that the population was definitely increasing as a result of the complete protection from hunting provided by the International Whaling Convention of 1937, and the successive annual flying census had shown a steady southward push of the population with an increasing number of stragglers scattered along the coast as far south as Cape San Lucas.

On February 3, 1953, Ewing and Andreas Rechnitzer saw a cow and calf just within the Cape near San Jose del Cabo; and along the Pacific Coast between the Cape and Bahía de Almejas they counted 78 gray whales, including two calves. On February 27, 1953, Ewing and Gilmore again saw a cow and calf near San Jose. We wondered what so large a number of gray whales were doing so far south of the southernmost established nursery at Almejas.

Was this the restless wandering of the adolescents and other nonbreeders or were these adults probing for new calving grounds, or perhaps returning from nurseries not yet known? Three times Ewing and Hubbs, Ewing and Rechnitzer, and Ewing and Gilmore reconnoitered the east coast of the peninsula, with negative results. The whales did not seem ever to enter the Gulf proper. The small number of calves among those seen south of Almejas, and the well established restriction of the calving grounds to points much farther north, prompted Gilmore to conclude that these southern individuals were indeed stragglers, aimlessly passing the time before the northward migration began. Nevertheless the air map showed many coastal lagoons and bays on the eastern side of the Gulf, along the coast of Sonora and Sinaloa, the configuration of which aroused our curiosity and kindled our resolve to explore them during the winter of 1953-1954.

Our break came in early January, 1954, during the course of a flight made along the eastern shore of the Gulf by Ewing in company with Dr. Robert Menzies, a staff member at the Scripps Institution of Oceanography, the object of which was the collection of marine isopods and a study of the distribution of the common marine borer *Limnoria*.

While Menzies was busy hacking in wood structures for *Limnoria*, Ewing stayed with the float plane which, because of its unfamiliarity, attracted large crowds from the isolated fishing villages along the way. With his very limited Spanish Ewing asked the local fishermen about whales, but got only one bite. In a lagoon, midway between Mazatlán and Topolobampo, one village patriarch remembered seeing whales and calves in years gone by. He thought perhaps they still came in

to Bahía de la Reforma, the next lagoon to the north. He told of mothers that spent the winter with their calves, arriving in early February and leaving in April, and of how these mothers would place themselves between their babies and the vicious *bufeos* (killer whales). He could not say whether these whales were similar to the ones found in Baja California *because he had never been on that side of the Gulf*. Shortage of gasoline kept Ewing and Menzies from a systematic search of Bahía de la Reforma, but during a single pass over the bay Menzies spotted one lone whale that seemed to share our astonishment at the encounter, for it stuck its head straight up out of the water in a "spy-hop" typical of the gray whale.

Shortly thereafter, in early February, Gilmore and Ewing made a similar flight in the same plane expressly to look for gray whales and land on the water in all likely lagoons and bays to query fishermen about the whales and any pertinent past history which might throw light on the quest.

Much to our surprise and pleasure we actually saw and counted 44 gray whales, of which 26 were adults and 18 calves, meaning that at least 18 of the adults were cows. They were found in the following places:

	Adult	Calf
1 Feb.: Punta Final, northwest side of Gulf, just north of Bahía de Los Angeles. Probably a stray adult .....	1	
3 Feb.: Bay off Puerto Yavaros, just north of Topolobampo, 26° 40' N. ....	7	6
3 Feb.: Bahía de la Reforma (B. Santa Maria, just south of Topolobampo), near south entrance (not included in final count because this bay was revisited on northern flight and more were counted), 25° N. ....	(4)	(2)
5 Feb.: Bahía de la Reforma, on return flight, near south entrance .....	5	2
Bahía de la Reforma, near north entrance in channel .....	13	10
	26	18

In the north channel of Bahía de la Reforma another pair was listed as doubtful. And just north of Bahía Banderas, far to the south between San Blas and Puer-





to Vallarta, near 20° N., we saw another whale which might have been a gray, making a possible 47. We flew too fast to have scored the same whale twice, but on the other hand we may have missed some submerged.

The flight covered the Gulf coast from Punta Diggs near San Felipe to Bahía de Los Angeles in the north-west Gulf; thence across the Gulf past the southern end of Isla Angel de la Guarda and Isla Tiburon, to Bahía Kino (landing in the open water near the village), and to Guaymas. The next day we flew to Mazatlán, with stops at the estuary of Río Yaqui, at Estero de la Luna at Punta Lobos, Bahía Huivuilay (Pabellon Colorado), at Puerto Yavaros, at Laguna de Agiobampo (Bucarehús), and Topolobampo. The flight from there, after refueling, was straight to Mazatlán, with orbits over Laguna or Bahía de Navachiste and Bahía de la Reforma (or Santa Maria).

From Mazatlán we made a "round robin" flight to Puerto Vallarta and return, with intermediate stops at San Blas and Isla Santa Isabella to inquire for whales. Coming north from Mazatlán again, before crossing the Gulf to La Paz, we scrutinized Bahía de la Reforma thoroughly along its inside channel near the north and south entrances and outside the island-bar. We saw many more gray whales than on our way south, leading us to replace the count of 3 February with that of 5 February.

Nowhere we stopped and inquired did we learn of whales concentrating in winter in the lagoons or adjacent waters outside, though humpbacks were found common at Isla Isabella just off San Blas, where they were seen apparently mating and feeding.

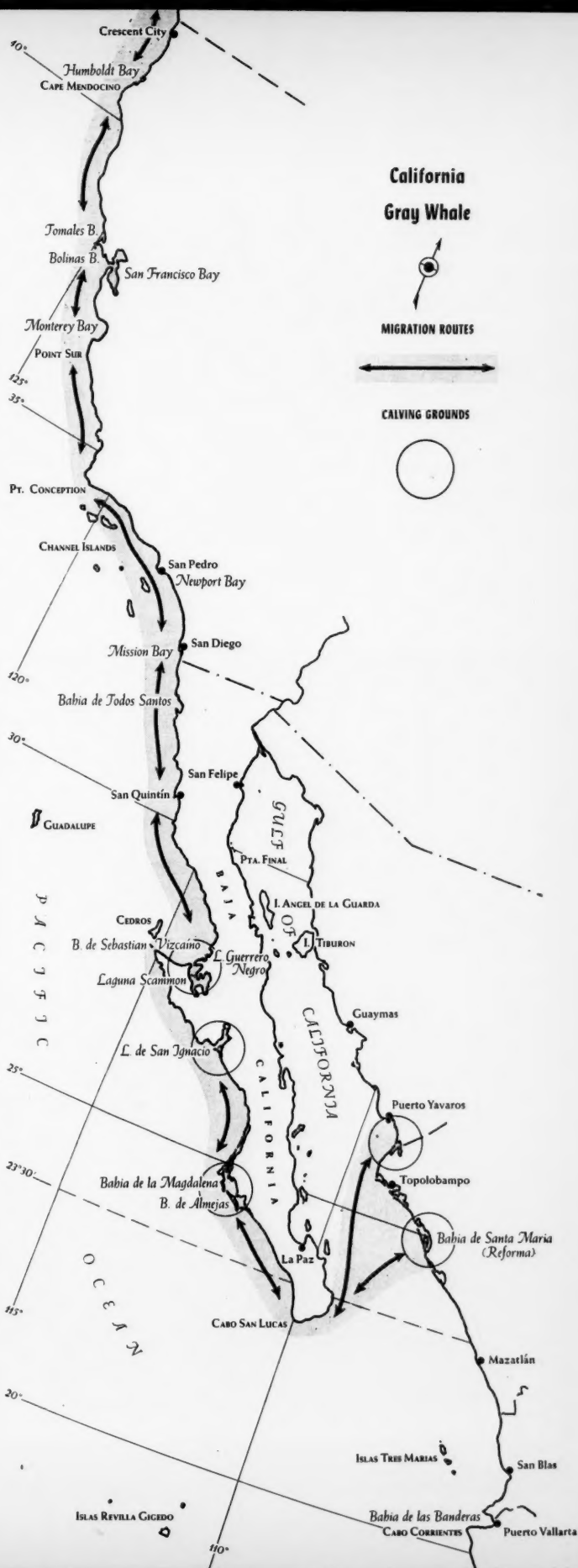
On a flight over the same area with Ewing on 17-18 February in a Cessna 180, Dr. Hubbs and Mrs. Laura C. Hubbs saw almost the identical number of gray whales in exactly the same places as on the flight by Ewing and Gilmore. This points to well-established residence of the same cows in the same area for the duration of the calving season.

The significance of this discovery of calving grounds on the eastern side of the Gulf of California is that it explains survival of the gray whale during the critical years of heavy whaling from 1850 to 1880 and again from 1924 to 1938, when numbers appeared to have dropped to the vanishing point. Also, the calving grounds on the Gulf are large enough to allow significant increase of the population beyond what issues from the already well known calving lagoons of the west side of Baja California.

Two other facts of interest stand out in thinking about the gray whales in the Gulf; first, the numbers were small, and may never have been large, else the whalers should have discovered them long ago; second, most were cows with calves, indicating that mating takes place chiefly on the west coast of Baja California

(Continued on page 30)

Map prepared for *Pacific Discovery*  
from data supplied by the authors.



Fishing at Neah Bay over 50 years ago.  
This picture by S. G. Morse shows Makah  
Indians bringing in their catch of halibut.  
Dugout canoes are seldom seen today.

## EARLY OLYMPIAN



➔ This aged, blind Quinault woman was  
still able to weave baskets when the late  
S. G. Morse took her picture.

⚔ Old-time tree fallers—the late William McMullen  
and William Cowan of Port Angeles, Washington—here  
are getting ready to fall a fir from spring boards in the  
Merrill-Ring camp at Pysht many years ago.

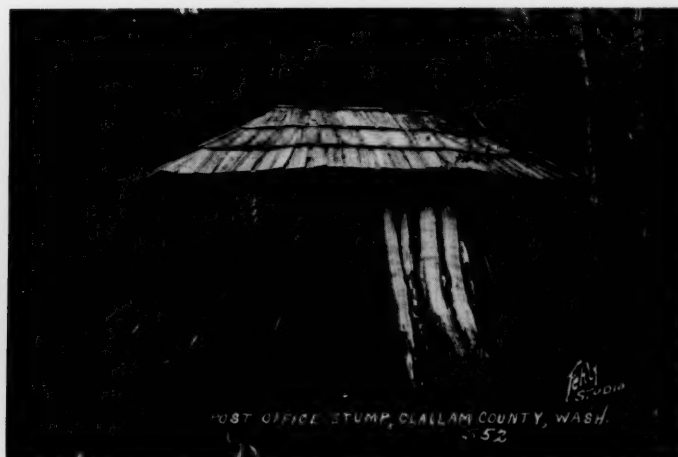




Last potlatch—  
S. G. Morse described  
this scene as an  
Indian gathering at  
Tatoosh Island for the  
last potlatch. Indians,  
before the white man,  
came in their canoes  
from all over the  
Northwest for these  
big social events that  
were such an important  
part of their culture.  
At the top of the cliff is  
the light station on the  
island and around it  
the Makah tribal houses  
where the Indians lived  
during the fishing  
season and prepared the  
fish for food. Morse was  
the lighthouse keeper  
in those days.

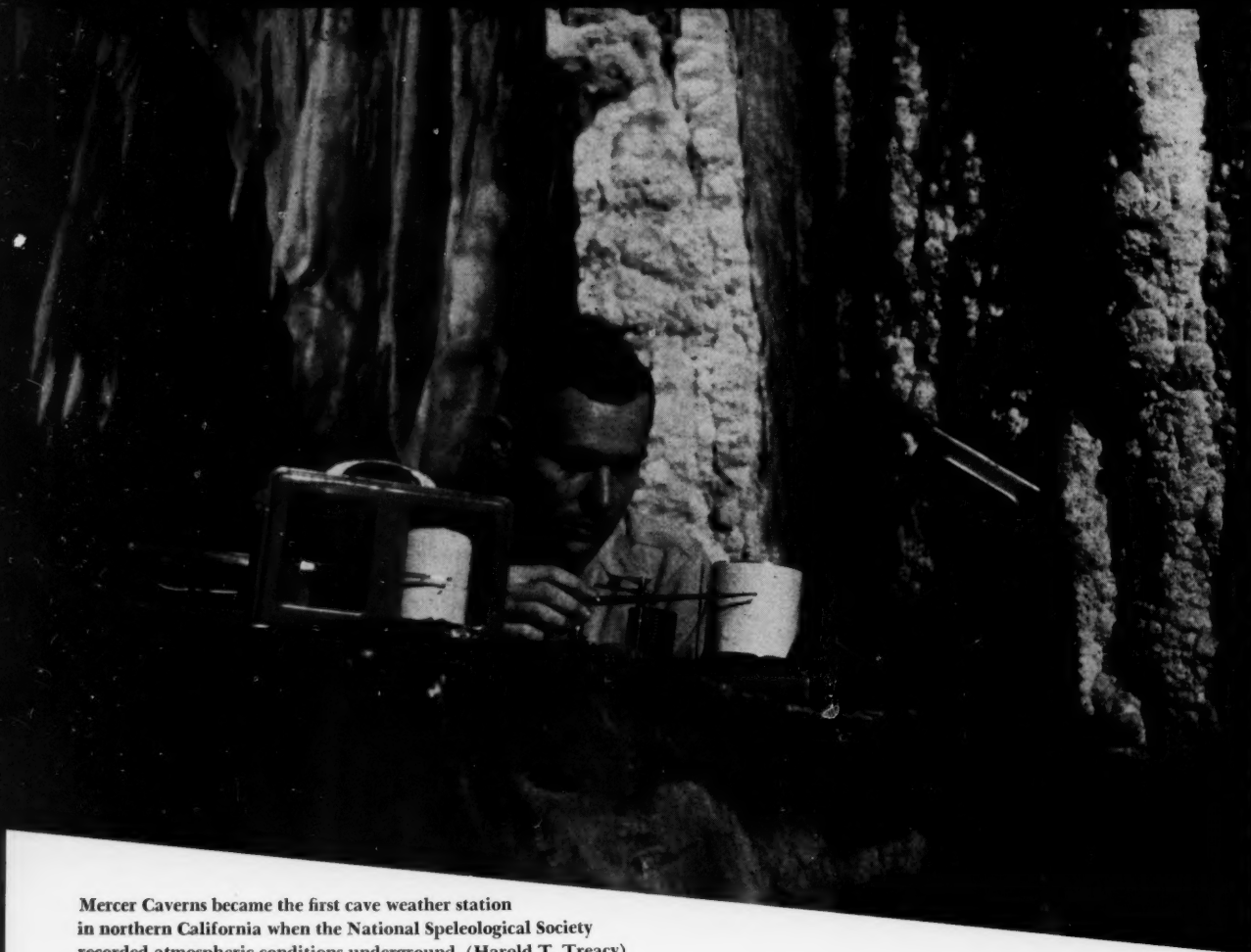
*All photographs and  
caption material are  
by courtesy of the  
Port Angeles Evening  
News, and thanks are  
owing to the Editor,  
Charles N. Webster.  
The Centennial Edition  
celebrating Washington  
Territory's founding,  
in which these pictures  
and many others of the  
early days appeared,  
may be had by sending  
a quarter with your  
request to the paper.*

ψ In pioneer days logging was almost exclusively  
with oxen, which dragged the logs over greased skid  
roads to dumping grounds either at a sawmill or in  
the salt water. Much logging was near the beach.



Δ When Tom Stringham was named postmaster at McDonald,  
60 years ago, at the junction of Little River and the Elwha,  
he lived in this stump which still stands in the brush on the  
east side of the Olympic Hot Springs road south of Little  
River. Later the post office was named Elwha and moved  
to the west side of the Elwha River.





Mercer Caverns became the first cave weather station in northern California when the National Speleological Society recorded atmospheric conditions underground. (Harold T. Treacy)

ARTHUR LANGE

## CAVES: New Science Frontier of

THE STUDY of caves and of the life and features which they contain is, as a science, new to the Pacific Coast. *Speleology* (the science of caves), as this study is called, represents a composite of sciences, embracing in particular their underground implications, and applying these to the problems which caves present. Thus speleology is made up of such studies as those of underground drainage, climate, biological communities, prehistoric remains, formation of sediments, crystals, and the record of ancient man — to name but a few of its components. Yet at the same time it should not be construed as an arbitrarily defined activity whose sphere of attention is bounded by the wall of daylight at the cave entrance; for the study of underground phenomena is of little significance if it cannot be related to the features and events of

the surface. For example, the landscape of limestone terrain, known as *Karst topography* (after a limestone plateau in Yugoslavia), is a direct expression of its underlying caverns; the disappearances of streams are clues to the enigma of underground drainage; the life of the sheltered interior reflects perhaps inhospitable circumstances of the outdoors; and the traces of man and animals encountered underground represent a unique sampling of a former population of the earth. It is the recognizing of this "two-storied" meaning of caves that tells the difference between the cave-explorer and the serious speleologist.

### To save our caves

The Western Speleological Institute is a research group devoted to the study and preservation of natural caves, and as such, it has conducted several



field expeditions, including a survey of the caves of California and Nevada. In their operations they find, however, that the actual study of the caves proves to be the easier half of their objective; it is rather the protecting of the caves from the "careful hand and careless foot" of inconsiderate visitors and deliberate vandals that is their most difficult problem. Alongside the soot-blackened, scribbled-on, chopped-up walls and stalactites of the majority of our caves, the carved trunks of aspen trees of the forest are but an oversight; alongside their broken-down, sawed-off stalagmites and pilfered crystals, one can hardly lament the stumps of great trees which have seen service: for trees heal their wounds and forests regrow, within a lifetime. Cave destruction, on the other hand, is not a temporary ill; it means the extinction of the cave as a thing of beauty and a studio of science for countless generations in the future. Untold are the numbers of examples of these grim displays encountered in our Western caves, and still unforeseen is a broadly effective solution to the problem. The things of beauty and discovery that remain, however, are more than rewarding enough to supply the drive to preserve them. Do not the elegance and significance of the crystalline drapery illustrated justify any measures — no matter how stringent — necessary to preserve them? Yet these are but two aspects of many such phenomena,

## er of the West

which are becoming lost to our view as the roads of man penetrate continually farther into the wilderness. Let us consider in greater detail the role that caves and their features play in our world of knowledge and appreciation, so that we may more carefully evaluate their significance and the argument for their protection.

### Sea caves and lava tubes

Not all of our Western caves, though many are large, are the underground universes that make up Carlsbad and Cacahuamilpa, and only a few are known to contain the weird, eyeless fish and blind amphibians such as characterize Marvel and Mammoth caves. Our caverns are nevertheless intriguing and enlightening, from the standpoint of their geologic origin and structure as well as for



their many exceptional deposits of fossil remains.

In California alone we encounter a rare diversity of forms: marine caverns, sandstone dens, rock shelters, lava tubes, not to mention a generous representation of elaborate limestone caves. All of these, with the exception of the lava tubes, have their origin in a plane of weakness—a joint or fracture — in the country rock in which they are housed, the initial infection gradually spreading so as to produce eventually a sizeable cavity or cave. In limestone the process is carried out by the solution of the rock walls by water charged with natural carbonic acid; in granite, by the fracture and avalanche of cliff faces and large rock masses; in sandstone, through erosion and abrasion by rain and windblown sand; and in the fault-riven faces of the rugged Pacific coast sea

cliffs, by the incessant poundings of the broadside waves and the rhythmic compression of the surge.

These last-mentioned caves, especially those of the Channel Islands off the southern California coast, comprise what is probably our finest exhibition of the development of caves from planes of weakness, for every one of the countless ominous openings and geyserlike blowholes displays a prominent fault or joint extending down the face of the volcanic escarpment and on through the underlying cavern, into which a prevailing swell is constantly retreating. With favorable seas it is

core of molten material. If in seeking a downhill course this material succeeds in locating an outlet of escape, either at the foot or sides of the flow, it leaves in the form of a cast the elongated hollow tunnel that we call today a lava tube. Its single unbranching passage is generally of uniform diameter throughout its extent, and is fringed with the hardened stalactitic drippings which bear evidence of the rapid disgorging of lava that once took place. Such tubes are often of great length — John Muir describes Pluto's Cave in northern California as penetrating its basalt bed for a mile.

Sponge Cave,  
a marine cavern  
on Santa Cruz  
Island.



possible to navigate the dark, echoing labyrinths within, some of which have been explored to a measured depth of 450 feet. Of all the sea caves of the islands, beautifully variegated Painted Cave of Santa Cruz Island is probably the most renowned. Its navigable extent is reported to exceed a quarter mile.

The one exception to the fracture origin of caves occurs in the case of lava tubes, which are found generously distributed throughout the extensive lava beds of northern California and Oregon. Their formation is, rather, attributed to a differential cooling of the molten material or magma comprising a volcanic flow at the time of eruption. The upper and lower strata of the fluid mass, being subjected to the relatively cool temperatures of the air and ground solidify first, abandoning to the contours of the underlying topography an interior

Some tend to accumulate a permanent deposit of ice which contributes to the ornamentation of the cave. These so-called "ice-caves" are still but little understood.

#### Limestone caves

Natural limestone caves are the type most familiar to the layman and, as might be expected, most interesting to the speleologist. They occur in many forms and lengths — ranging from the narrow Indian burial shafts of the Mother Lode region, to the intricate subterranean systems of multileveled chambers and corridors underlying the limestone lenses of the Sierra Nevada. But in no case are these systems randomly designed, for their patterns reflect the inherent structure of the containing rock mass, with its configuration of planes of weakness, variation of chemical composition, and relation to the drainage of the region.



The entrance  
to Cueva Valdez,  
Santa Cruz I.

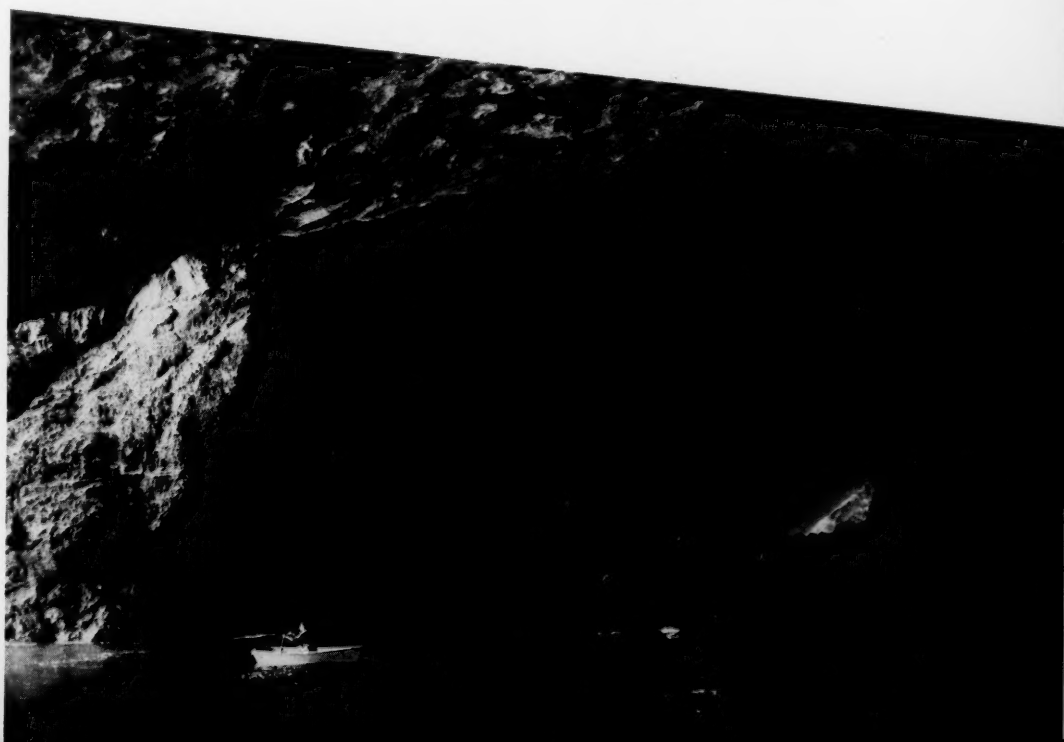
Since solution of the rock can take place only where the acidular waters can penetrate, namely along the fractures, it is those along which the cave chambers and passages evolve, the maximum development following along the circuit of most intense flow. The flow, being controlled by the upland and overlying topography and the general elevation of the surface above the level which the drainage is seeking, will effect a cavern-system expressing these under-and-over relationships as they prevail at the time of formation. In this way, a modern cave records by its structure the story of the landscape which overlay it during the geologic episode in which it lay in the path of its generating waters. But this is only part of the fascinating history.

#### Underground glaciation

When the dissolving waters finally abandon their channels and galleries for still lower routes

beneath the cave, air invades the emptied chambers and residual surface water trickles in through cracks in the ceiling and walls, setting a new mechanism ticking — the precipitation of crystalline calcite. Stalactites grow downward from the ceiling, and their overflow gives rise to stalagmites on the floor. Flowstone forms where sheets of water pour along the slopes. Dense colonies of pretzel-like helictites sprout from any niche where moss might grow, were there sunlight to feed it. These and many more crystalline growths, called *speleothems*, come to populate the chambers with the statuary and jewelry which makes them so priceless. And deep down in the microscopic growth rings of these curious structures we find still another record — that of the variations in the supply of moisture and humidity of the chamber throughout their development. Though they are an almost inscrutable calendar to read today, there will come

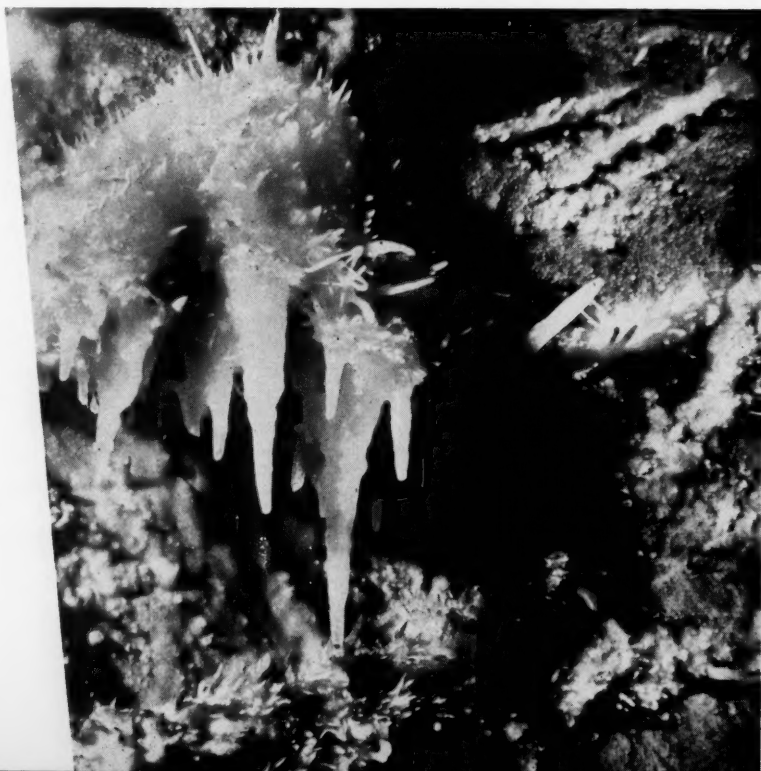
Yates Cave on  
Anacapa Island  
was formed by the  
ocean's surge,  
which disintegrated  
the rock along the  
fault that can be  
traced across the  
ceiling in the photo-  
graph. (Walter S.  
Chamberlin  
photos)





▲ Calcite assumes many different forms and figures when it is deposited in the limestone caves. Here it occurs in the form of radiating crystals.  
(George Mowat)

➤ A helictite cluster with stalactites growing downward from it.  
(Edward Danchy)



a time when man's understanding of their processes will allow their translation; meanwhile, every shattered stalactite is a potential record lost.

There are still other episodes of earth's history to be learned from within. The caves of the southern Sierra Nevada provide an excellent example of the effect of glaciation underground. After the final uplift of the range, when Mt. Whitney and its company attained their 14,000-foot heights, glaciation enshrouded the crest in alternating ice-cloaks, between which sun and rain collaborated in washing down-mountain the cobbles, gravels, and powdered fragments which the ice dismembered from the peaks. Since many of our canyon caves lay in the path of these great floods, they became invaded by torrents of water and sediments, their galleries and corridors becoming filled and blocked by glacial debris. With the return of mild climates to the region the run-off abated and, within the caves, slowly dripping waters proceeded to deposit crystals of calcite, stalagmites, and flowstone over these sediments, sealing them in place and rendering them invulnerable to successive invasions of glacial run-off.

There thus remain today in our mountain caves cemented gravels and sands derived from perhaps all four known glacial advances of the Sierra, and within these deposits are found entrapped the crystallized bones and skeletons of mammals. If man was present during these events, he too may be represented in the cavern glacial record. No finer inscription of the glacial history of the range



Stalactites, stalagmites, and columns are formed through the precipitation of calcium carbonate by dripping water. Man's arm gives scale. (George Mowat)

can be asked, than that record of these sequestered chambers, where neither rain nor frost nor wind disturbs the treasured evidence.

#### An "underground roller-coaster"

These records and many more have been encountered in the desert ranges of Nevada as well as the boreal country of the Sierra. Great subterranean conduits have been explored, through which water once coursed under high pressure from uplands to valleys, filling the passageways to their ceilings with their torrential flow, traveling in places up steep grades, or undulating in the manner of a gigantic siphon. Model Cave, in eastern Nevada, might be described as an underground roller-coaster, being essentially a single tube nearly two thousand feet in length, along whose course, both on the crests of the rises and in the intervening troughs, are encountered the layers of sand, gravel, and boulders, brought in by the flow and attesting to its torrential volume in times past. Similar systems, called *pressure channels*, may be functioning today deep within the hollow heart of each limestone range, but we can hardly hope to gain access to them, before uplift and dissection of the present landscape allow their contents to drain.

#### Earth's fever chart

The knowledge to be gained from underground reconnaissance, however, is not limited to geologic phenomena. One finds below a suggestion of a history of our outdoor climate, in the record of temperatures of the cave walls and atmosphere. For it is known that the heat of the sun, reaching the surface of the land, in time succeeds in pene-



trating deep into the interior of the rock, in a manner characteristic of the *surface* fluctuations of temperature. These surface fluctuations constitute the *thermal history* of the region, and the dips and rises of this temperature record correspond on one scale to our annual seasons or day-to-day variations, while in the long-range view they represent glacial advances and interglacial episodes. All of these time-variations of past temperature of the surface are preserved today in the depth-variations of the rock walls of the caves, the relationship between the two being mathematically calculable, in a way that may allow us to read the prehistoric climatic changes which controlled the

Helictites have defied the researches and study of mineralogists for many years. (Edward Danchy)

23



migrations and behavior of man and animal. Experimental observations conducted in the two caves thus far examined reveal the presence of the previous winter's cold during the summer, as prescribed by the laws of heat flow.

#### Dwellers of the dark

The environment in which life occurs is often found reflected in the peculiar characteristics and adaptations of its inhabitants. From such considerations one might expect to meet, in the damp and dripping atmosphere, constant temperature, and eternal darkness of caverns, extraordinary forms of life. This is certainly the case as demonstrated in the tortuous labyrinths of Cave City Cave in California's Mother Lode — a cave once called one of the great wonders and curiosities of the West.

Here among its maze of chambers and corridors and deep, placid pools thrives an industrious pop-

Range species. Snails, earthworms, and small mammals — rodents for the most part — complement the cave population, while special forms of fungi and algae represent the plant kingdom. Of all these denizens of the dark, however, the ubiquitous bats are undoubtedly the most familiar, and few indeed are the caves in which they cannot be found commuting to and from their secret retreats in the deepest recesses. But it must be remembered that many of these life forms are found in but one or only a handful of caves, and within them but in small colonies; being rare, they need protection from the threats of cave destruction and excessive collecting.

#### Treasure-chest of fossils

Besides serving as residences for living biological forms, certain — in fact many — Western caves have assumed the role of protective depository for important fossil remains of prehistoric mammals. Near the shores of man-made Shasta Lake in northern California is situated Potter Creek Cave, not a large one as caves go, but one which has received more scientific attention, so far, than any other California cave. At the time of its discovery in 1878, there were found in its one large chamber called the Golgotha the fossilized bones of the rare Pleistocene short-nosed bear, *Arctotherium*. Then again in 1902 the cave was visited, this time by an organized expedition of paleontologists from the University of California under the direction of W. J. Sinclair, and at that time the floor of the Golgotha was systematically excavated, almost to the point of being turned inside out. Altogether between four and five thousand determinable specimens were disinterred, comprising 52 separate specimens of mammals, of which 21 proved to be extinct forms, and seven, new species. Included were the remains of Pleistocene sloth, horse, camel, bison, and elephant. In the words of Dr. John C. Merriam: "The remains . . . furnish the most satisfactory representation of the Quaternary fauna of California that has yet been obtained in one locality." Besides Potter Creek Cave, there occur many similar "golgothas" in the West, some of which have already yielded valuable deposits, and more that are still awaiting discovery and excavation. Those that are known, however, are in serious need of effective protection from pilfering and trampling, in order that they may remain in their undisturbed state until the time and means are available for their study.



Twenty-one extinct species of mammals were found in Potter Creek Cave in 1902 — seven of them were new to science. The search for new forms still goes on. (George W. Moore)

ulation of flies, spiders, millipedes, and amphibians isolated from the illuminated world. Studies of these specimens have revealed a number of them to be forms new to science, or types far beyond their normal outdoor range; among them, spiders and insects which have lost their pigmentation and faculty of sight, frogs which have temporarily changed their coloration to a ghostly gray-white, in the manner of a chameleon, and the first salamander collected in a California cave — a Coast



Upper Natural Bridge, Calaveras County, California. (Doug Kirkland)

#### Caves and man

If the records of prehistoric animal life yielded by our Western museum-caves arouse wonderment, the discoveries relating to early man currently being made in caverns of Nevada and the Mother Lode should excite the curiosity of all who witness them. And it is actually possible to observe these archeological excavations in Moaning Cave, Calaveras County, California, which is open to visitors. Here, buried in the stalagmitic floor of the massive and inspiring Main Chamber, 170 feet beneath the surface, has been revealed an amazing aggregation of ancient Indian skeletons and artifacts — the mute remains and accoutrements of dead believed long ago consigned to this immense communal tomb. In 1950 the California Archaeological Survey carried out the preliminary excavation of the upper strata of these deposits and ascribed the skeletal material to the Middle Horizon (1500 B.C. to 500 A.D.) Miwok Indians, who then inhabited the Sierra foothills. Subsequently, suspecting that still older material might be encountered at greater depth, archeologist Phil C. Orr of the Santa Barbara Museum of Natural History, with the aid of geophysicist O. H. Truman, penetrated 15 feet down into the calcite encrusted mass of skulls and bones before meeting an apparent bottom layer. Studies of the minute laminae of the

flowstone crusts have placed the minimum dates for the accumulation of these remains between 12,500 and, just possibly, 50,000 years ago.

Such records of early man — as these in Moaning Cave — and the records of more recent Indians found throughout our vast Southwest, are, of all the valuable features exhibited by caves, the most vulnerable to vandalism. Time and again an archeologist will pack up his tools at the close of a season, returning to the site the following year, or even week, to find it but a disheveled trash pile of bones, dirt, and discarded artifacts, all trace of sequence and relation having been obliterated in the greedy rummaging of irresponsible persons seeking trophies. The speleologist and archeologist together are striving desperately to preserve our caves and sites from such destruction, not only until the time that present-day means allow their study, but beyond — in order that future scientists with far more refined tools of examination may possess material to study, and that future inhabitants of our West may inherit something still of natural beauty. To insure these commitments both of today and of the future all possible help and coöperation are needed on the part of scientists whose work sometimes invades the province of the cave, and on the part of citizens who hold an interest in the phenomena of nature and an appreciation of her art.

## "REALM OF THE NEBULAE"

**E**ARLY in the evening at this time of year in the central latitudes of our country, the broad band of the Milky Way lies along our horizon and is largely hidden from view. At right angles to the Milky Way's central line, which astronomers call the *Galactic Equator*, lie the *poles*. Looking now at the sky overhead we are surveying the region about the galactic north pole, a part of what the eminent astronomer Edwin Hubble has called the "Realm of the Nebulae."

In discussing these things it is useful to keep certain terms distinct: *Milky Way*, *Galaxy*, and *extra-galactic nebulae*, or simply *galaxies*.

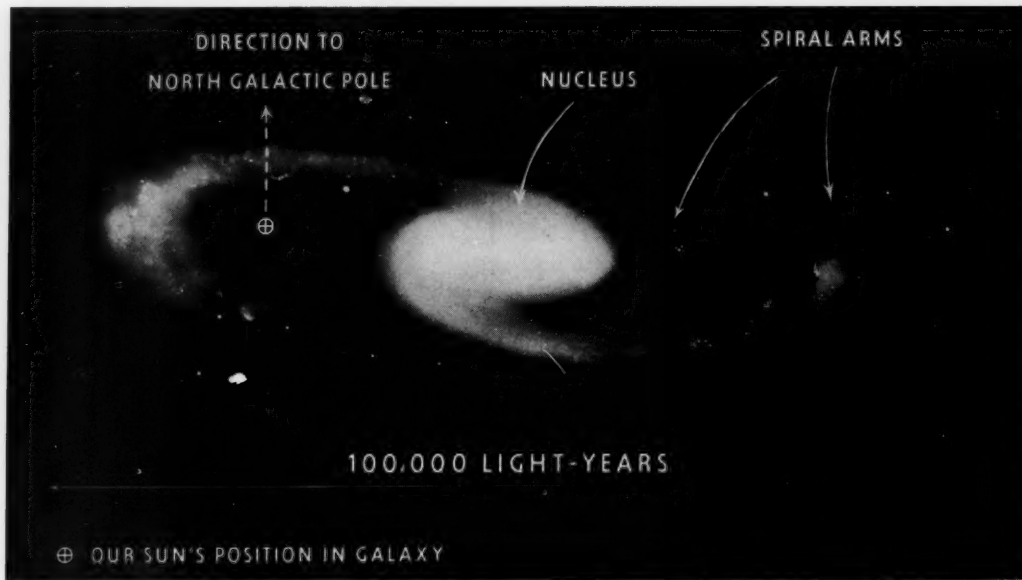
The Milky Way is the broad, irregular band of faint light referred to above. It is best seen in late summer, coursing through the constellations of Cygnus, Aquila, Scorpio, and Sagittarius.

The Galaxy is the great flattened, spiral formation made up of some thousand billion stars and vast clouds of interstellar gas and dust, of which our sun is an insignificant member (see first sketch). That part of the galaxy we can see from our position 30,000 light years off-center is a tiny fraction of the whole; this portion produces the Milky Way.

tant galaxies in the direction of the constellation Leo. (See sketch also). The area of the sky represented by the picture is only one quarter of the apparent disc of the full moon, yet in this tiny patch the half-hour long exposure with the 200-inch Hale reflector shows four contrasting galaxy types. The spiral type viewed edgewise in the center resembles our own Galaxy, though ours probably has a less conspicuous nucleus and more pronounced spiral arms. During the past two years astronomers have announced important results in the fields of radio-astronomy and the distribution of bright stars, which have shown clearly the form of the spiral arms in our Galaxy and bear out the points of resemblance between it and other spirals.

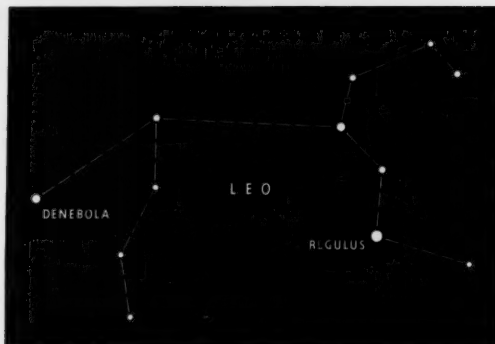
The globular type appearing in the upper left is composed of stars similar to those making up the nucleus of a spiral, with no stars or interstellar material of the kind found in spiral arms. This classification of stellar populations is the basis of important work in cosmology at the present time. The two objects at the right, upper and lower, are examples of a comparatively rare type — the barred spiral.

Until recently the distance of this cluster of four



The extra-galactic nebulae (simply galaxies, for short) are systems of stars completely beyond the confines of our Galaxy. They also contain billions of stars (more or less) but come in a variety of forms, some similar and others very dissimilar to the spiral structure of our Galaxy.

Our photograph shows a remarkable group of dis-







Group of four nebulae in Leo, 200-inch photograph. (Mount Wilson & Palomar Observatories)

galaxies was estimated to be of the order of seven million light years; a recent revision of the distance scale based on study of Cepheid variable stars — the “Lighthouses of the Sky” — indicates that the true distance is at least double the previous estimate, or 14 million light years!

One of the most startling discoveries of modern times is that our universe, consisting of galaxies, is *expanding*. This interpretation is based on the observation that the spectrum of a galaxy is always displaced a little to the red end; if this is accepted as due to the well known *Doppler effect*, then motion away from the observer is indicated. A peculiarity of the apparent motion of a galaxy is its proportionality to distance; the farther away it is, the faster it seems to be going. The group shown in our photograph is receding at the rate of 800 miles per second! Much of current theory

and speculation in cosmology has to do with fitting the observed expansion into the framework of a mathematical model of the universe. Some of these models conceive of time and space as *finite*; others view it as *infinite*. Certainly it is one or the other—which, no one yet can say. There are prospects that current observing programs at Mount Palomar may resolve our dilemma in a few years.

The original print shows many faint galaxies which have been lost in the reproduction process; these must be in the neighborhood of two or three hundred million light years away, and receding at a rate of approximately 12,500 miles per second. On one of the very best photos taken with the giant reflector on Palomar a distance of two billion light years from our own Galaxy has been surveyed. For the present, at least, this is the end of the trail.

L.E.S.

## Mountains and mesas of flowers

**Manual of the Plants of Colorado, for the Identification of the Ferns and Flowering Plants of the State.** By H. D. Harrington. Sage Books, Denver, Colorado. Feb. 27, 1954. x + 666 pp., frontis. map. \$8.00.

Our first impulse after going over the pages of this good account of an alluring flora was to drop everything and dash off to Colorado to do some field work! If one is attracted by the plants of desert canyons and mesas, then the western region is the place to go; but if the plants of high peaks and meadows are the lure, then the alpine parts of the Rockies must be visited. The wonder and joy of botanizing in Colorado is that these two extremes of habitat are not far apart and can both be visited on the same outing. But wherever the flower-lover or botanist now goes in Colorado, Dr. Harrington's work on Colorado plants must be used as the last word and guide. It should be a botanical best-seller, not only for Colorado but also for the adjoining states that are less fortunate and without an up-to-date state flora. My chief adverse criticism is, that a botanical text that is called a "manual" should be so large and heavy. I know that I would not choose to carry a quarto volume weighing five pounds in my knapsack if I were hiking in the desert or climbing above 10,000 feet, even if it is called a manual!

After a short introduction by Dr. Harrington and an account of the "Vegetation Zones in Colorado" by David F. Costello, the work proceeds to the customary description of the plants with analytical keys for their identification. In all, 2,794 species and 351 subspecies and varieties are considered in a manner admirably gauged between liberal and overly conservative extremes, following closely the many monographic and revisional studies of genera and sections that have appeared in the last 20 years. There is a full and excellent glossary at the end and an index to common names and genera. The text is reproduced by offset.

JOHN THOMAS HOWELL

Department of Botany  
California Academy of Sciences

## The proper study of mankind

**Anthropology Today: An Encyclopedic Inventory.** Prepared under the chairmanship of A. L. Kroeber. The University of Chicago Press, Chicago, Illinois. 1953. xv + 966 pp. \$9.00.

The 1951 International Symposium on anthropology organized by the Wenner-Gren Foundation for Anthropological Research resulted in this imposing volume which summarizes the existing state of knowledge in a multitude of fields loosely assembled under the name *anthropology*. Or in any case it represents the wide scope of endeavors pursued by its practitioners in this country. There are fifty articles altogether, each written by one of the leading men in a particular field, several of them from abroad. A mere listing of some of the papers may give the reader an idea what sort of subjects an anthropologist may tackle: thus we have Erwin H. Ackerknecht writing on "Paleopathology"; William L. Straus, Jr., on "Primates"; Henri V. Vallois (France) on "Race"; the late Wendell C. Bennett on "New World Culture History: South America"; Hans Weinert (Germany) on "Der Fossile Mensch" (this is the

only article in the volume not in English); Carlos Monge (Peru) on "Biological Basis of Human Behavior"; J. Grahame D. Clark (England) on "Archeological Theories and Interpretation: Old World"; Joseph H. Greenberg on "Historical Linguistics and Unwritten Languages"; Benjamin D. Paul on "Interview Techniques and Field Relationships"; Ralph Beals on "Acculturation"; J. M. Tanner (England) on "Growth and Constitution." These are but a few arbitrarily selected. But there are many others, some representing an historically slanted account of the development of a particular branch of anthropology; some evaluating the existing state of knowledge or the methodological procedures; some, finally, dealing with possible applications of anthropology in human society, Western and other.

How anthropological research may contribute to medical practices is shown by William Caudill in "Applied Anthropology in Medicine." Industrial applications are discussed by Eliot D. Chapple in "Applied Anthropology in Industry"; while Alfred Métraux evaluates the possible contribution of an anthropologist to government in "Applied Anthropology in Government: United Nations."

But in turn anthropologists remain perpetually indebted to the achievements made by their colleagues in other sciences. When Robert F. Heizer writes on "Long Range Dating in Archeology" it is obvious that no reliable archeological dating could exist without contributions from such diverse fields as paleobotany, geology, climatology, astronomy, or nuclear physics. Influences from clinical psychology or psychiatry transpire from an article, "Culture, Personality, and Society" by A. Irving Hallowell. The indebtedness of a physical anthropologist to a geneticist is explained when William C. Boyd writes on "The Contributions of Genetics to Anthropology." And how an anthropologist may profit from an ecologist is shown indirectly by Marston Bates in "Human Ecology."

Perhaps more than anything else, this volume shows that the study of human society cannot be left to a narrowly specialized discipline and that new knowledge in one may be essential to the development of others and vice-versa.

**An Appraisal of Anthropology Today.** Edited by Sol Tax, Loren C. Eiseley, Irving Rouse, Carl F. Voegelin. The University of Chicago Press, Chicago, Illinois. 1953. xiv + 395 pp. \$6.00.

This is a companion volume in which are recorded virtually unedited proceedings and discussions of the Wenner-Gren symposium on *Anthropology Today*. Eighty-two distinguished scientists participated in it, fully one third of them from outside the United States which adds to the variety of spices. The value of this publication seems to be chiefly in impromptu suggestions offered by the participants that are not reported in the more formal writings in the larger volume.

BORYS MALKIN

University of Washington

**Handbook of the Indians of California.** By A. L. Kroeber. California Book Company, Ltd., Berkeley. 1953. xviii + 995 pp., profusely illustrated with photographs, text figures and maps, inset maps, many in several colors, 2 folded maps in back-cover pocket. \$12.50.

First published 1925 as Bulletin 78 of the Bureau of American Ethnology of the Smithsonian Institution, A. L. Kroeber's monographic *Handbook of the Indians of California*

filled a need that was indicated by the early exhaustion of the G.P.O. issue of "several thousand copies" and subsequent increase in demand and price on the collectors' market. Its reissue was inevitable, and was accomplished through courtesy of *Ethnology's* present Chief, Matthew W. Stirling. Thanks are due the California Book Company for the clean, well bound photo-offset reprint, which is without change except for title-page, author's Foreword, and Dedication. The none-too-large printing was put on the market at the end of the year. The publisher's address is 2310 Telegraph Avenue, Berkeley 4, California.

As a source book this detailed description of "the customs of each of some 50 little nations" comprising the Indian tribes of California is so firmly established and widely known that it suffices to say here what has doubtless been said often: for *anyone* purposefully concerned with Californian Indians, past or present — students, scholars, librarians, officials, writers of history or fiction, laymen with more than casual interest, and certainly editors! — A. L. Kroeber's *Handbook* is indispensable, to be possessed or consulted in libraries according to the intensity of use.

### Birds in your bushes

**Songbirds in Your Garden.** By John K. Terres. Thomas Y. Crowell Company, New York. 1953. xiv + 274 pp., full-color frontis., numerous line cuts in text. \$3.95.

In his Introduction to this book Edwin Way Teale says that "becoming acquainted with individual birds, with free, unrestrained, unafraid birds day after day just outside the window is a sport that has assumed the proportions of a major American pastime." John K. Terres' book is a veritable encyclopedia of information to enable anyone who wishes, to have his wild birds at his window, in season, and many kinds in his hand as well as in his bush. It tells him what kind of bush will attract a certain bird, and what to have hopefully in his hand, or on his window ledge. It shows types of bird houses with proper dimensions for various sizes of birds, and various feeding trays and devices, including an "experimental bird cafeteria" in which birds can reveal their gustatory preferences. The whole is abundantly livened with lore and anecdote of birds and bird-watching.

### Science fare

**The Way of Science, Its Growth and Method.** By John Somerville, Ph.D. Henry Schuman, New York. 1953. 172 pp., line drawings. \$2.50.

This compellingly clear introduction to science for secondary school age is one of Schuman's *Man and His World* Series, which includes — among a dozen or so titles, so far, by experts — **The Moon**, by George Gamow, and **Life on the Earth**, by Rose Wyler and Gerald Ames. Dr. Somerville, of the Department of Psychology and Philosophy, Hunter College, has briefly outlined the history of science, then explained magnificently the scientific method, with the aid of a problem out of Sherlock Holmes, and proceeded to relate science to society — and to creative imagination. Science, to this author, is no sacred cow, but a fascinating game, a way to fuller, better living, and a ready tool of creative endeavor. This is the kind of book that opens doors to our youngsters. Further recommendation: To English classes as an example of clear, organized prose.

## DISCOVERY IN BOOKS

### Caves, whales, and Drake

**Caves of Adventure.** By Haroun Tazieff. Translated from the French by Alan Hodge. Harper & Brothers, New York. 1953. 222 pp., 20 photographs. \$3.00.

If you have claustrophobia, do not explore caves. If you have it real bad, do not read about people exploring caves. If you are a pathological case, do not read Haroun Tazieff. The jacket blurb, "a personal account of danger, death and discovery far beneath the surface of the earth," would probably stop you from opening the book. If you are not such a case, then open the book, if possible at a time when you can arrange not to be forced to close it temporarily en route to the last page.

This introduction is not intended to give the idea that *Caves of Adventure* is just another science thriller. Our "Caves" article in this issue is purposely designed to introduce speleology into these pages as a serious science. Admittedly, however, it is somewhat shy of the aura of danger-fraught adventure that hangs inescapably over the exploits of even this young science's most studiously careful and sensation-avoiding exponents. Adventurer in science the author of the more recent *Craters of Fire* may be; nevertheless, reading Tazieff's account of the discovery and first exploration of a particular cavern in the Pyrenees may follow that of our general article profitably for several reasons. For one, the elements of adventure, danger, even death, are not to be discounted, as the presence of all three in the meticulously planned, scientifically justified descent into Pierre Saint-Martin soberly demonstrates. Consider, if you would explore caves, for "Loubens's life hung on the turn of a screw." And here, for another, is reason enough for the book. Having shown us why caves must be explored, and having furnished insight into men who must challenge this final frontier of earth-exploration, Mr. Tazieff has put on record with dignity and fitting simplicity a moving human document, the story of Marcel Loubens, whose tragic accident, heroically attempted rescue, and death a quarter-mile under the ground, were reported to the world in August 1952. Tazieff saw Loubens fall, shared the agony of waiting days for help, watched him die. *Caves of Adventure* is thus in part a young scientist's epitaph.

**Of Whales and Men.** By R. B. Robertson. Alfred A. Knopf, New York. 1954. xii + 300 pp., 27 photographs, line drawing. \$4.50.

If most of us did not know that "some twelve thousand men go down to the Southern Ocean each year to hunt the whale," neither did Robert Blackwood Robertson, psychiatrist, physician and surgeon, before he went down there with 650 of them on a factory ship, Senior Medical Officer for the 1950-51 season. And he a Scot, with Scotland second only to Norway in modern whaling!

Modern whaling? It is big business. Twenty-odd pelagic whaling expeditions go each year to the Southern Ocean; averaged, the capital value of each is some eight million dollars; the gross profit of each, "well over" six million dollars. About the same time Edison "blew out the sperm-oil lanterns and candles forever" and so ended the whaling of the *Moby Dick* era, a Norwegian was inventing the har-

poon gun. This powerful weapon "made possible for the first time the capture of the fast and non-buoyant whales that (unlike the sperm whales which are inedible) man can use for food as well as for lubricant and illuminant, and the whaling industry, despite Edison, was assured of resurrection, though in a different form." Twenty thousand whales are shot in the Antarctic each year, under the scrutiny of the International Whaling Board.

Thus we get a picture in the round of whaling today — the floating factory, "a great hulking lummock of a ship not much smaller than the *Queen Mary*" and mother to a fleet of nine catchers, two buoy boats, and two corvettes for towing whales to her; instead of the old tryworks on deck a huge industrial plant below for rendering and conversion; the complete scientific laboratory aboard for products research; the sea-going Company offices; the permanent shore base on South Georgia — all to the end that practically everything of the whale is utilized but the spout. Our margarine is vegetable — the Britisher's is whale oil! And a large proportion of his traditional "beef" is now whale meat. The byproducts are legion, particularly the pharmaceutical, but also the agricultural — bone meal fertilizer, and cattle feed.

*Of Whales and Men* will not be read and talked about, however, after its publication the same date as this issue, just for its information about modern whaling (Book-of-the-Month Club selection, it was prepublished in part in *The New Yorker*). For it is mainly a book about whalemen. The doctor reveals his first intent and his final purpose in one sentence: "I had not known the whalemen long when I realized that the importance of describing this unknown breed to my fellow psychiatrists was as nothing to the importance of revealing them to the whole world as *men*." He had candidly declared in his Preface that, because "a doctor cannot talk of his patients, a ship's officer cannot talk of his shipmates," his whalers are unrecognizable as specific persons. But this statement is to be immediately forgotten. How Dr. Robertson came by his literary skill we do not know, but it is of such an order that his composite characters are as alive and ring as true as any from the pen of a first-rate novelist. Mansell, Mark, Commander Gyles, old Engineer MacDonald with his bottle and his Bible — all will live in the literature of whaling, not as types but as individuals, as true as if only the names had been changed. In this and in all ways — it is a topnotch action-adventure story too — *Of Whales and Men* is a literary work of a high order, which is also to say that it is deeply philosophical beyond the obvious implications of its subject matter. Robust, shot with racy humor, it is a man's book, but it will not hurt your co-ed daughter and should not offend your maiden aunt. It is too honest to hurt or offend an honest reader.

**Sir Francis Drake.** By James A. Williamson. No. 1, Brief Lives. Collins, St. James's Place, London. 1952. (Distributed in U.S. by Macmillan). 160 pp., illus. \$1.75.

Sir Francis Drake is bound to sail across the pages of *Pacific Discovery* from time to time; therefore we are glad to have just discovered a biography of our sometime hero that we can, any time, recommend. The jacket-statement that James A. Williamson is "the foremost living authority on Elizabethan maritime history" we have no reason to

dispute. The one coupled with it that "here . . . is the model biography of Sir Francis Drake" is proved to our satisfaction by reading the book.

The springs of action in the life of the Devon farmer's son who rose solely by what he accomplished to his peak of fame and favor are as plain and direct as the active age in which he lived. Religious persecution drove his Protestant father to the Kentish coast, "thus Francis Drake knew ships and seamen from childhood." Events made the mostly Protestant Elizabethan seamen enemies of Spain. Spanish loot from Peru crossing the Isthmus of Panama gave Drake the chance to strike the enemy and try to enrich himself to boot. The big haul of the three-year circumnavigation—the voyage in which the *Golden Hind* may have entered the Golden Gate — really set him up with queen and country. Success made him "England's chief sea commander."

We are mainly interested, perhaps, in Drake as discoverer in the Pacific. But "the history of the voyage . . . is full of mysteries that have not been cleared up: . . . whether he really thought of trying for the North-West passage home, where exactly his California harbour was. . . . Drake, like all commanders, kept a journal of his voyage. He delivered it to the Queen on his return, and it has never been seen since." D.G.K.

**Historical Metrology:** A new analysis of the archaeological and the historical evidence relating to weights and measures. By A. E. Berriman. J. M. Dent & Sons, Ltd., London; E. P. Dutton & Co., Inc., New York. 1953. xvi + 224 pp., 66 illus. \$3.75.

What is the origin of the beer barrel measure? of the metric system? What is the geometry of the pyramids? An engineer has dug into British museums and libraries for the history of weights and measures, and come up with some surprising correlations between ancient and modern. He suggests the \$64 question: was the earth measured in remote antiquity? Fascinating, if slightly technical.

(Continued from page 15)

where intense mating activity has often been observed.

So far we have not seen whales crossing the open Gulf between Cape San Lucas and the mainland. Possibly some gray whales spend the summer near the head of the Gulf as many finbacks do, and as some grays do at Crescent City, northern California. The lone one seen at Punta Final encourages this idea which, however, is not yet confirmed as fact — except for that one, all the whales seen so far near the head of the Gulf have been finbacks.

Thus, a new chapter has been added to the natural history of the gray whale. Many details of their life cycle remain to be uncovered, some by future flights to Mexico and some from such easy points of observation as the public whale watch maintained by the National Park Service at the Cabrillo National Monument on Point Loma, San Diego. As the full story unfolds we shall learn whether in the future a limited harvest of surplus whales may be permitted for meat and other useful products, without again decimating the population.





### Dinosaur is still in danger

EDITOR, *Pacific Discovery*:

Reference is made to the article entitled "Danger to Dinosaur" by Harold C. Bradley, *Pacific Discovery*, January-February 1954.

The article presents information and arguments opposing the proposed construction of Echo Park Dam in eastern Utah by the U. S. Bureau of Reclamation which would cause the inundation and destruction of the only Dinosaur National Monument, and fill large portions of the unequaled, beautiful park canyons, first with water and later with silt eroded from the mountains.

An additional reason why the Echo Park Dam should not be built and a national park of great economic and historical value be destroyed at this time, is the unneeded agricultural production which additional stored water would provide.

The great surpluses of farm crops which now are and have been produced for many years at the expense of the U. S. taxpayers, is evidence that there is no actual economic need for additional costly stored water to bring more acres of land under irrigation at this time, or within the foreseeable future. Not only would the stored water be used for irrigation but the hydro power generated at the dam would also be available for pumping water to irrigate additional acres to produce unneeded surplus crops.

In the years ahead, if and when the population growth requires additional agricultural production, improved farming techniques constantly being discovered and the better use of the lands and water supplies now developed, can supply the necessary increased production more economically than that created by the destruction of great national assets like Dinosaur Monument and the canyons of Echo Park.

There seems to be a tendency for the Bureau of Reclamation to consider it necessary and desirable that the present generation of engineers rush the construction of all possible irrigation projects as though future engineers would not be able to do a better and more economical job when the production created will be actually required.

As soon as a water storage reservoir is constructed, heavy fixed costs begin and continue more or less throughout the life of the reservoir. These costs include interest and the amortization payments on the capital investment until the construction costs are recovered, and operation and maintenance which are perpetual costs.

As soon as a reservoir is constructed and put to use, particularly in the middle and lower Colorado basin, rapid filling with eroded materials from the mountains begins, and the water storage capacity and economic value of the reservoir decreases in proportion to the rate of filling until the reservoir is completely filled with earth. Therefore, any reservoir constructed can only be useful and prove to be a profitable investment if built to serve its life during a period when the created production is required by the nation. Why rush the construction of reservoirs, particularly on questionable sites like Echo Park, to store irrigation water and produce crops not needed by the present generation, and thereby rob some future generation of the production when urgently needed?

MILO B. WILLIAMS  
Consulting Engineer

March 15, 1954

*Engineer Williams made the first irrigation census of the Western states for the Department of Agriculture during the last national Census. He has done appraisal work in the area for the Federal Land Bank, and he is now technical director for large government irrigation projects in Haiti where about 1,000 acres of land are being prepared for irrigation each month.—Ed.*

EDITOR, *Pacific Discovery*:

You are to be commended for printing Dr. Bradley's fine article and the editorial, "What Does Conservation Mean Today?" by A. Starker Leopold. I sincerely hope that both of those excellent statements of some of the problems of conservation will be widely read and discussed. To this end, I have been doing a little missionary work here in the office where I work, and have, through your publication, interested several people in the Dinosaur controversy and in your magazine.

PHILIP HYDE

Casablanca, Maroc, March 20, 1954.

*Mr. Hyde, who is now on technical duty overseas for our Government, took some of the beautiful photographs, including the cover, that gave added strength to Dr. Bradley's cogent arguments against the planned destruction of Dinosaur National Monument.*

*The House Subcommittee on Irrigation will probably approve Echo Park Dam on April 29, and the full Committee shortly after. It can still be stopped on the floor! If you are with conservationists against this needless dam, write your Congressmen at once. It's the second letter that counts!—Ed.*

## EASY CHAIR COMFORT

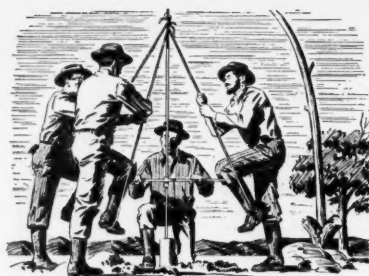
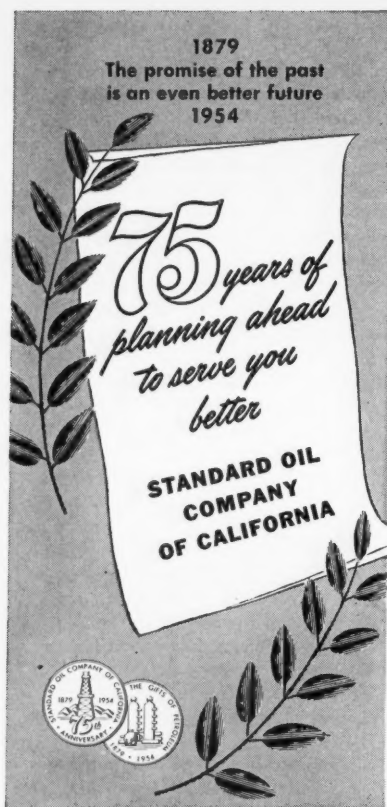


## LONG RUGGED WEAR

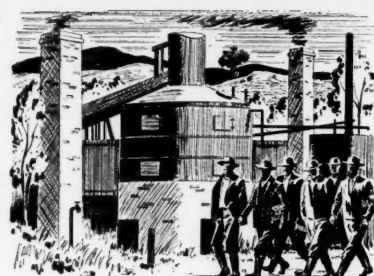
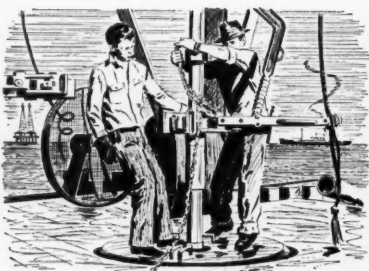


## AMERICA'S FINEST OVERALL

Since 1850



**From the West's first successful oil wells** of 1879, Standard's drilling operations have stretched all over the world—even in ocean depths 4 miles off shore—to get the oil which you and our friends in other free nations need more and more.



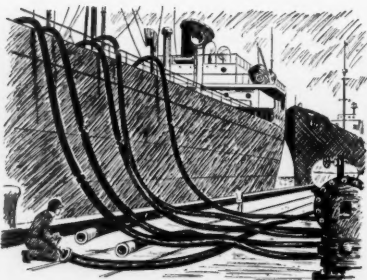
**Gasoline was a waste product** in Standard's first refinery of 1879, but it's king today. We've developed fuels that made better engines possible, used research tools like the chassis dynamometer (below) to bring you today's top gasolines.



**Before horses gave way to horse-power**, Standard's wagons of the '80's brought only kerosene, harness oil and axle grease to Western farms. Now our insecticides, weed-killers, fertilizers help increase crop yields and add to your food supply.



**First steel tanker in the Pacific**, Standard's *SS George Loomis* back in 1888 began helping us put oil where you need it. Today 26 tankers, 3,748 miles of pipe line, thousands of tank trucks serve your oil needs wherever you are in the West, Alaska, Hawaii.

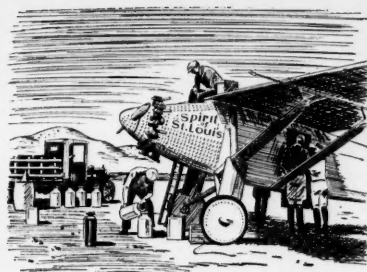


**World's first gas station** was opened by Standard in 1907 at Seattle, Washington. Since then, we've pioneered the car care you enjoy now—windshield cleaning, tire, battery, lubrication service, even "Chevron-matic" credit cards to save you time.

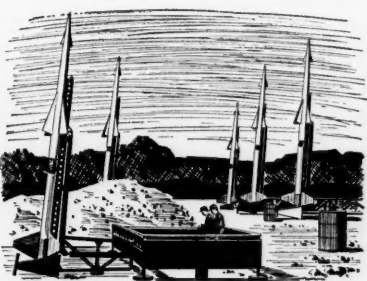




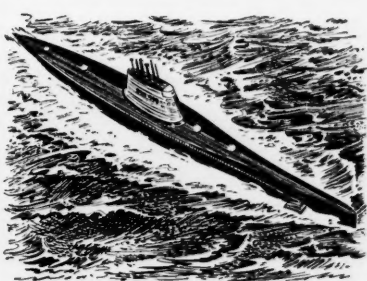
**First oil industry 8-hour day** was introduced by Standard in 1917. This was a major step in our employee relations programs which include health, pension, insurance benefits and a stock purchase plan—95% of eligible employees own Company stock.



**On Lindbergh's trans-Atlantic flight** in 1927, we fueled "The Spirit of St. Louis." Now, safer airliners, faster military planes mark aviation progress which Standard's research has served. Now we're making fuels for tomorrow's jets and rockets.



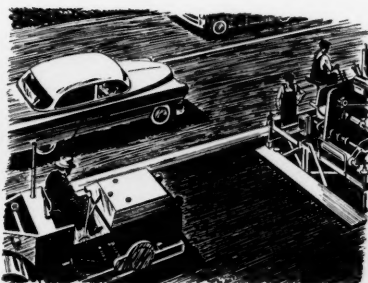
**New power for transportation** and industry was born in 1935 when Standard's first compounded diesel lubricating oil made high-speed diesel engines a practical reality. Now our scientists are working on lubricants for the first atomic submarine.



**Making housework easier**, Standard made detergents available for "soapless soaps" in 1946. Later we produced the basic ingredients for wrinkle-proof clothing for men and women, adding again to the more than 1100 products we make from oil.



**We pioneered peace-time use of atomic energy.** In 1950, using radioactive piston rings, Standard measured engine wear as it occurs, used this research to develop better motor oils, including a new oil so superior it can boost gas mileage up to 15%.



## *The promise of the past is an even better future*



You wear a suit woven from oil, drive on tires born in a refinery, whisk over asphalt super-highways, read about kerosene-powered planes that crack the sound barrier. And you live in a West far beyond the dreams of those 1879'ers who formed the Company from which Standard grew.

What lies ahead? If the past is any clue, oil will be saving you more work and money, improving your transportation and putting more luxury in your living. And Standard will continue to play a big part in this progress as we follow our 75-year tradition of planning ahead to serve you and the nation better.



**STANDARD OIL COMPANY  
OF CALIFORNIA**



# BOOKS AVAILABLE BY MAIL

...from the Academy

**NATURE'S WAYS** by Roy Chapman Andrews **\$3.75**  
plus tax, 10c postage

Comprehensive presentation of how nature's creatures adapt themselves for survival. The strange and curious animals, birds, fish, and insects shown and discussed have "Believe It or Not" fascination, plus unmatched natural history value. Illustrated with photographs and drawings.

**MAMMALS OF LAKE TAHOE** by Robert T. Orr **\$4.00**  
plus tax, 10c postage

The principles of mammalian classification and means of identifying the fifty-three species of native mammals occurring in the high Sierran lake country. Includes the historical background and the characteristic geological and botanical features of the Lake Tahoe region. Illustrated with drawings by George and Patricia Mattson.

**CALIFORNIA GEM TRAILS** (second edition) by H. C. Dake **\$2.00**  
plus tax, 10c postage

A guide to California gem localities for the amateur gem hunter. Covers the entire state.

**INSECTS CLOSE UP** by Edward S. Ross **\$1.50**  
plus tax, 10c postage

*Insects Close Up* is a photographic survey of the insect world. Short, lively, authoritative text accompanies each of the 125 close-up photos and drawings.

**HOW TO MAKE A HOME NATURE MUSEUM** by Vinson Brown **\$2.50**  
plus tax, 10c postage

If you like to pick up things on outdoor rambles this book shows you how to have the rest of the fun — by arranging your collections so they have real meaning and can be enjoyed by others. Illustrated by Don Greame Kelley.

**MARIN FLORA** by John Thomas Howell **\$4.50**  
plus tax, 10c postage

Describes the plants that are native or have become naturalized in Marin County, California, where strikingly diverse conditions exist within a small area (from Mount Tamalpais west to the Pacific Ocean and east to San Francisco Bay). Not for the strict amateur.

**THE PERENNIAL ADVENTURE** by Susanna Bryant Dakin **\$3.00**  
plus tax, 10c postage

A tribute to Alice Eastwood, the book includes a foreword by John Thomas Howell; a paper by Miss Eastwood; and her high-school valedictory address. Printed by Lawton Kennedy in a limited edition.

**MAKING YOUR OWN TELESCOPE** by Allyn J. Thompson **\$4.00**  
plus tax, 10c postage

Complete and detailed instructions for making a 6-inch reflecting telescope. Step-by-step directions and numerous diagrams.

**CHAMBER'S MINERALOGICAL DICTIONARY** **\$4.75**  
plus tax, 10c postage

Complete dictionary of names and mineralogical terms. Forty plates of colored illustrations.

Add 3½% tax if you live in San Francisco; 3%, California outside San Francisco.

Send order and check or money order to:

**CALIFORNIA ACADEMY OF SCIENCES**

GOLDEN GATE PARK, SAN FRANCISCO 18, CALIFORNIA



